APPENDICES

ENVIRONMENTAL ASSESSMENT (EA)

FOR THE

CONSTRUCTION OF THE COMMISSARY ADDITION

AT

EGLIN AIR FORCE BASE, FLORIDA

Prepared for:

DEPARTMENT OF THE AIR FORCE

EGLIN AIR FORCE BASE FLORIDA

Woodward–Clyde Federal Services
Consulting Engineers, Geologists and Environmental Scientists
2014–B Lewis Turner Boulevard Fort Walton Beach, Florida 32548

REPORT DOCUMENTATION PAGE

Form Approved
OMB No 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	JUNE 7, 1991	FINAL / 1991

4. TITLE AND SUBTITLE
APPENDICES FOR EA FOR the CONSTRUCTION OF the COMMISSARY ADDITION at EGLIN AFB, FLORIDA

5. FUNDING NUMBERS
Ø

6. AUTHOR(S)
USAF

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
AIR FORCE SYSTEMS COMMAND (AFSC)
ANDREWS AFB, FL

8. PERFORMING ORGANIZATION REPORT NUMBER
Ø

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
— see #7 —

10. SPONSORING / MONITORING AGENCY REPORT NUMBER
Ø

11. SUPPLEMENTARY NOTES
N/A

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for PUBLIC Release;
Distribution is UNLIMITED

12b. DISTRIBUTION CODE
A

13. ABSTRACT *(Maximum 200 words)*

ABSTRACTS TO SUPPORT EA FOR UPGRADE & EXPANSION OF THE EGLIN AFB COMMISSARY

14. SUBJECT TERMS
EGLIN Commissary

15. NUMBER OF PAGES
200 +

16. PRICE CODE
Ø

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLAS	UNCLAS	UNCLAS	UL

GENERAL INSTRUCTIONS FOR COMPLETING SF 298

The Report Documentation Page (RDP) is used in announcing and cataloging reports. It is important that this information be consistent with the rest of the report, particularly the cover and title page. Instructions for filling in each block of the form follow. It is important to ***stay within the lines*** to meet ***optical scanning requirements***.

Block 1. Agency Use Only *(Leave blank)*.

Block 2. Report Date. Full publication date including day, month, and year, if available (e.g. 1 Jan 88). Must cite at least the year.

Block 3. Type of Report and Dates Covered. State whether report is interim, final, etc. If applicable, enter inclusive report dates (e.g. 10 Jun 87 - 30 Jun 88).

Block 4. Title and Subtitle. A title is taken from the part of the report that provides the most meaningful and complete information. When a report is prepared in more than one volume, repeat the primary title, add volume number, and include subtitle for the specific volume. On classified documents enter the title classification in parentheses.

Block 5. Funding Numbers. To include contract and grant numbers; may include program element number(s), project number(s), task number(s), and work unit number(s). Use the following labels:

C	- Contract	**PR**	- Project
G	- Grant	**TA**	- Task
PE	- Program Element	**WU**	- Work Unit Accession No.

Block 6. Author(s). Name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. If editor or compiler, this should follow the name(s).

Block 7. Performing Organization Name(s) and Address(es). Self-explanatory.

Block 8. Performing Organization Report Number. Enter the unique alphanumeric report number(s) assigned by the organization performing the report.

Block 9. Sponsoring/Monitoring Agency Name(s) and Address(es). Self-explanatory.

Block 10. Sponsoring/Monitoring Agency Report Number. *(If known)*

Block 11. Supplementary Notes. Enter information not included elsewhere such as: Prepared in cooperation with...; Trans. of...; To be published in... When a report is revised, include a statement whether the new report supersedes or supplements the older report.

Block 12a. Distribution/Availability Statement. Denotes public availability or limitations. Cite any availability to the public. Enter additional limitations or special markings in all capitals (e.g. NOFORN, REL, ITAR).

- **DOD** - See DoDD 5230.24, "Distribution Statements on Technical Documents."
- **DOE** - See authorities.
- **NASA** - See Handbook NHB 2200.2.
- **NTIS** - Leave blank.

Block 12b. Distribution Code.

- **DOD** - Leave blank.
- **DOE** - Enter DOE distribution categories, from the Standard Distribution for Unclassified Scientific and Technical Reports.
- **NASA** - Leave blank.
- **NTIS** - Leave blank.

Block 13. Abstract. Include a brief *(Maximum 200 words)* factual summary of the most significant information contained in the report.

Block 14. Subject Terms. Keywords or phrases identifying major subjects in the report.

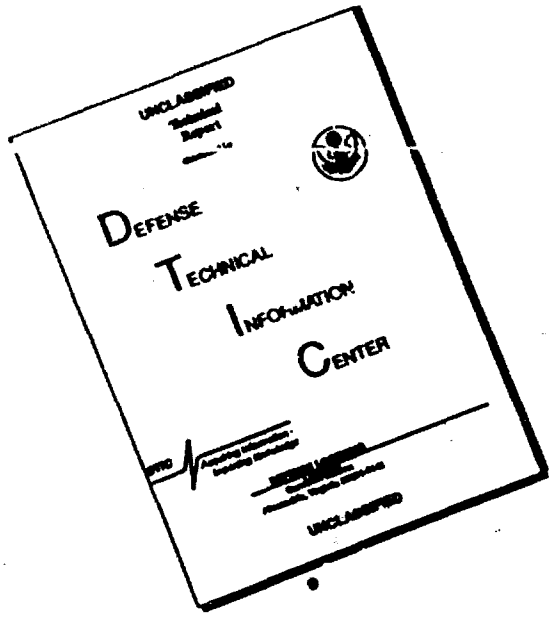
Block 15. Number of Pages. Enter the total number of pages.

Block 16. Price Code. Enter appropriate price code *(NTIS only)*

Blocks 17. - 19. Security Classifications. Self-explanatory. Enter U.S. Security Classification in accordance with U.S. Security Regulations (i.e., UNCLASSIFIED). If form contains classified information, stamp classification on the top and bottom of the page.

Block 20. Limitation of Abstract. This block must be completed to assign a limitation to the abstract. Enter either UL (unlimited) or SAR (same as report). An entry in this block is necessary if the abstract is to be limited. If blank, the abstract is assumed to be unlimited.

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

Air Force
Environmental Planning Division
(HQ USAF/CEVP)

Room 5B269
1260 Air Force Pentagon
Washington, DC 20330-1260

16 JUL 93

MEMORANDUM FOR DTIC (Acquisition)
(ATTN: Matt Mauby)

SUBJ: Distribution of USAF Planning Documents Forwarded on 1 July 93

ALL the documents forwarded to your organization on the subject date should be considered Approved for Public Release, Distribution is unlimited (Distribution statement A).

Jack Bush, GM-14

Mr. Jack Bush
Special Projects and Plans
703-697-2928
DSN 227-2928

APPENDICES

for

ENVIRONMENTAL ASSESSMENT (EA)

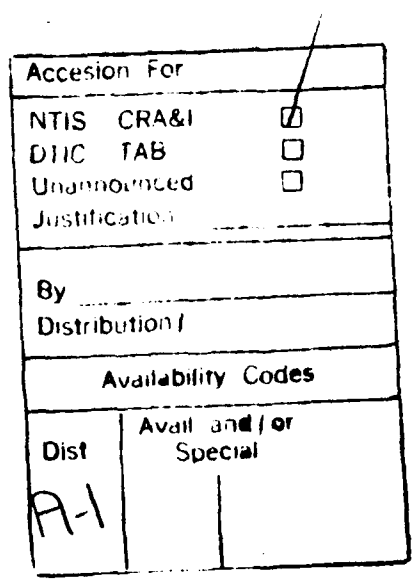
for the

CONSTRUCTION OF THE COMMISSARY ADDITION

at

EGLIN AIR FORCE BASE, FLORIDA

June 7, 1991



LIST OF APPENDICES

Environmental Assessment for the Construction of the Commissary Addition at Eglin AFB, FL

Appendix Number	Title/Description
I	Planning Study for Commissary Albert S. Komatsu & Associates, Inc., 29 November 1989
II	Assignment of Old Commissary Space Letters: •Army & Air Force Exchange Service, 14 December 1990 •Directorate of Civil Engineering, 6 December 1990
III	Jurisdiction Over Wetlands U.S. Army Corps of Engineers Letter dated 2 July 1990
IV	Jurisdictional Determination Florida Department of Environmental Regulation Letter dated May 20, 1991
V	Guidelines for Protection/Creation of Wetlands •Executive Order 11990, 24 May 1977 •AF Regulation 19-9, Chapter 5, 14 February 1986
VI	Biological Assessment Woodward-Clyde, May 1991
VII	Eglin Air Force AICUZ
VIII	Sediment/Water Quality Data •Woodward-Clyde Federal Services May 1991 •Engineering-Science January 1990 •Jammal & Associates, Inc. August 3, 1989 •Water & Air Research, Inc. September 1984
IX	Endangered Species Survey Natural Resources Branch Letter dated 15 May 1991
X	Cultural Resources Survey New World Research May 1991
XI	Storm Drain Calculations Carter & Burgess, Inc.

APPENDIX I

Planning Study for Commissary

Albert S. Komatsu & Associates, Inc.,
29 November 1989

Add / Alter Commissary

EGLIN A.F.B., FLORIDA

PLANNING STUDY
for
COMMISSARY
November 29, 1989

K O M A T S U

Albert S. Komatsu & Associates, Inc.

CREDITS

Komatsu & Associates, Inc.
550 Bailey Ave. Suite 715
Fort Worth, Texas 76107

Consultants

Carter & Burgess, Inc.
1100 Macon Street
Fort Worth, Texas 76102

Jammal & Associates, Inc.
5925 Benjamin Center Drive Suite 116
Tampa, Florida 33634

TABLE OF CONTENTS

SECTION I - INTRODUCTION

SECTION I INTRODUCTION

The design team of Komatsu & Associates, Inc., Ridgway Associates, Inc., and Carter & Burgess, Inc., was commissioned by the Air Force Commissary Service and Eglin Air Force Base to provide design and construction document services for the project titled "Add/Alter Commissary, Eglin AFB". The design team began work on July 1, 1989 under contract number F08 651-89-C-0096. On July 24, 1989 the 10% submittal was sent to AFCOMS and subsequently approved. Following that, the 30% design was completed and submitted for review. The 35% review was held on August 30, 1989 at Eglin AFB.

The project's original Scope of Work states:

> "The project includes construction of an approximately 76,500 square foot, single story commissary facility consisting of retail sales, nonperishable and refrigerated food storage, and administrative area. Primary function of the facility is to provide sales and processing of miscellaneous commodities and grocery items for the military community of the base. Sales and administrative areas will be air-conditioned. The project also includes parking areas, sidewalks, and site improvements around the facility."

There are other work items that are required by the nature of the project, but they are not necessarily described in the Scope. These include items such as:

1. Location of and construction of a new retention pond.
2. Filling to grade of the existing retention pond.
3. Construction of a new access road to the service areas.
4. Reconstruction of the storm drainage lines in the existing parking area.
5. Abatement or containment of the sanitary land fill.
6. Abatement of the asbestos found in the existing commissary building.

With this information in hand, the team began its work. The first task was to provide a complete site investigation. All site investigation work was done with the help of Jammal Associates, our Geotechnical Consultants, and Panhandle Associates, Inc., our Surveyors. The investigation effort resulted in a submittal that included a Geotechnical Report, a Survey, a report that located and described the contents of the sanitary landfill, and the Architectural solution.

The Architectural solution identified two potential problems. The first problem is a conflict between the parking area and the landfill. Approximately 35% of the parking lot is located over the existing landfill. The second problem is the siting of the retention pond. The retention pond site as identified by the Scope of Work lies within the boundaries of a sanitary landfill.

Because of these problems, Komatsu & Associates, Inc. was commissioned to provide this study. During the course of this study we intend to cover existing conditions and the impact of the sanitary landfill on the design configuration. This report will address abatement of the landfill as well as alternate means of building over the landfill. In addition to these studies, we will investigate several alternative solutions to avoid infringing on the landfill. As a final solution, we will study a remote site which will involve a new commissary on a "clean" site.

In addition, the Design Team has been tasked with providing the Asbestos Abatement specifications. These specifications will be provided with the 90% Design Submittal and will not be a part of this study.

SECTION II - STATEMENT OF WORK AND TASK OUTLINE

SECTION II - STATEMENT OF WORK AND TASK OUTLINE

As a part of the Site Investigation, the design team was to determine the extent of a sanitary landfill that was known to be adjacent to the site. The information that was available at the beginning of the project indicated that the landfill was 400 to 500 feet east of the existing commissary, and that it extended south across Memorial Trail an unknown distance. With this information, our Consultants (Jamal Associates) began a site investigation that was intended to identify the western edge of the landfill. Jammal Associates' report is included herein as Section No. VII.

The report found that the sanitary landfill impacted the proposed project in three areas. Approximately 35% of the proposed parking lot is to be located in the area of the landfill. As it happens, this is the portion of the parking area that is nearest to the Main Entrance. The second area of influence is the south corner of the proposed commissary. At this area of the site the landfill was found to be approximately 50 feet southeast of the corner of the proposed building. Although there is no direct impact on the landfill, the proximity raises the question of constructability. The third area of conflict lies across Memorial Trail in the site selected for the retention pond. The report determined that the entire area chosen for the retention pond is within the boundaries of the landfill.

The complete ENVIRONMENTAL CONDITIONS REPORT is included herein as part of Section VII. The report describes the methods that were used to sample the the landfill as well as a description of the materials found. It also locates the approximate western edge of the sanitary landfill. Please refer to the complete report.

When the areas of conflict were discussed at the 35% review, it was decided that additional information would be required before the design effort would be allowed to move forward. The Design Team was then asked to develop an outline, or Scope of Work that would describe the proposed report. In response to this request, the following outline was developed and submitted to AFCOMS and to the Base Contracting Officer's Representative.

SCOPE OF WORK

TASK NO. 1 - JAMAL & ASSOCIATES

PERFORM AN ENVIRONMENTAL ASSESSMENT - The Environment Assessment must address all issues normally required of reports of this type. In addition, the assessment must pay special attention to problems caused by the dump site and the special requirements of the retention pond.

1. Provide required environmental assessment information relative to the site and the area affected by the planned construction.

2. Identify alternate sites for the retention pond. Study each site to determine if the site is acceptable. Describe its positive as well as negative qualities.

3. Discuss options that are available relative to the dump, such as: abatement of all the dump or partial abatement of the dump. Other possible options include "capping" to allow construction of the parking lot over the dump without actually removing the dump.

4. Identify costs associated with various options, such as removal of the dump in total or in part, cost of various retention pond sites, etc.

5. Identify long term issues that could affect the project in the future, such as the possibility of a structural failure of the parking lot.

TASK NO. 2 - KOMATSU & ASSOCIATES, INC., CARTER & BURGESS, INC.

PROVIDE A PLANNING STUDY - The objective of the planning study is to identify options to the current design for the commissary. The study will review options that exist for alternate designs at the existing site as well as the possibility of other sites. The study will include:

1. A site visit for our planner to meet with the Base Planner, the Base Civil Engineer, the commissary operations people (the Store Manager), and other interested parties.

2. Research and definition of the parameters or design limits.

   •Square footage required by various functions
   •Acceptable functional arrangements
   •Parking requirements
   •Limitations of the current site
   •Alternate site criteria/selection, etc.

3. Design of the options

   •Building as currently designed with alternates that will allow for design of the parking lot and the retention pond
   •Alternate design for current site (alternate floor plan)
   •New building phased into the location of the existing commissary
   •Building on a site other than in the area of the present site.

4. Develop graphic presentation for inclusion in final document.

5. Develop written information for final document.

6. Integrate environment assessment into final document.

7. Develop cost data for each option.

8. Finalize document (report) assemble and mail to interested parties.

1 copy to each:	Base Planners Base Civil Engineers AFRCE (Capt. Peters)
2 copies to	AFCOMS (Jim Langford)

The report must address the following issues:

- Identify alternate sites for the retention pond
- Identify and discuss alternate methods of dealing with the sanitary land fill, i.e., removal, build-over, leave undisturbed
- Identify alternate design solutions for the commissary.
- Develop cost data to be used for comparison of various options.

SECTION III - BUILDING AND SITE DESCRIPTION

SECTION III - BUILDING AND SITE DESCRIPTION

The existing commissary is sited in a community service facility consisting of several facilities which include the Commissary and the Base Exchange. These two facilities act as the anchors for the community service facility. In addition, the site contains a snack bar, a movie theater, a class six store, cleaners, Burger King, and a banking facility. A separate building houses a satellite pharmacy which is located between the Exchange and the Commissary.

The community service facility is located adjacent to the family housing area and is easily accessible from the west gate. Traffic from the main gate must pass through the main operations area of the base and in fact must pass through a portion of the flight line to reach the commissary. At present, all patron and truck traffic must access the site via Memorial Trail.

The topography is relatively flat and in undeveloped areas heavily forested with pine and other species of native trees. The soil is sandy and well drained. Drainage is generally from the northeast to the southwest.

The present retention pond serving the site is located to the east of the existing commissary service access road (southeast of the warehouse). Presently, the area surrounding the pond is laden with heavy brush and new tree growth. The existing pond will have to be filled in as part of the planned expansion of the commissary.

The inactive landfill is located east of the existing retention pond. As a result of landfill operations, the site is a series of small rolling mounds and is heavily overgrown with timber and brush. The access to the landfill is difficult in this area due to ground conditions and vegetation. To perform any geotechnical investigations, the work must be done with hand augers.

The site typically drains to the east into the retention pond through a series of storm drains. The service area to the rear of the commissary and the exchange service area drains into the retention pond through a series of barrow ditches and culverts. Storm water drainage from the building is piped directly from the building to the retention pond.

The existing commissary is connected to the exchange by a precast concrete canopy covering a walkway which extends the full length of the commissary. The walkway extends to a canopy that is part of the exchange and allows protected pedestrian traffic to travel the length of the two buildings.

The commissary sales and food processing area is currently housed in a metal building which is approximately twenty years old. The present facility is in marginal condition. The sales and food processing areas are entirely too small for the volume of patrons using the facility.

A warehouse addition is located to the east of the original metal building and is constructed of precast concrete double tee wall panels. The roof

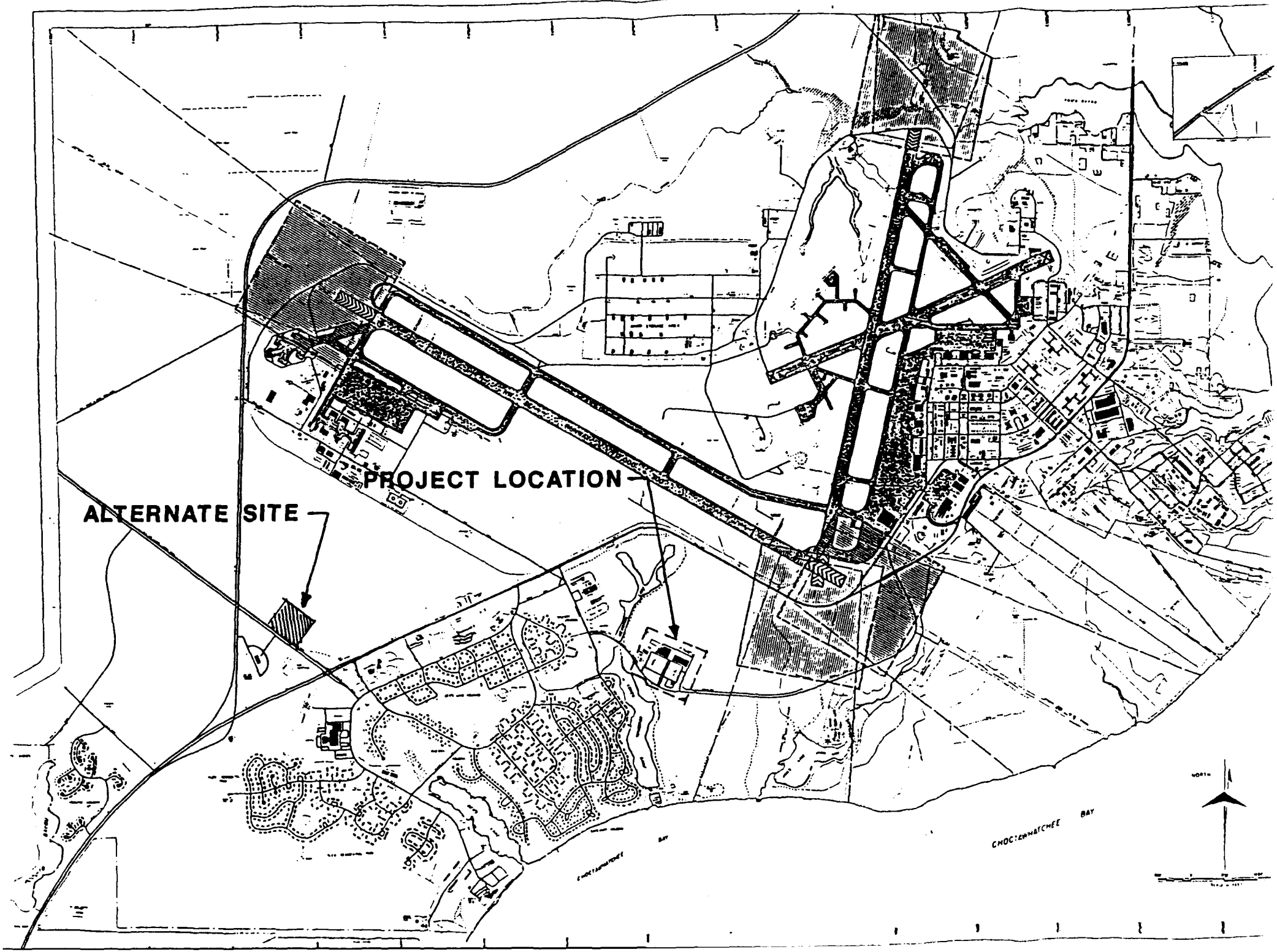
deck is also constructed of precast concrete double tee's and has a built-up roof. A facade of precast concrete tees that match the warehouse has been extended the full length of the commissary.

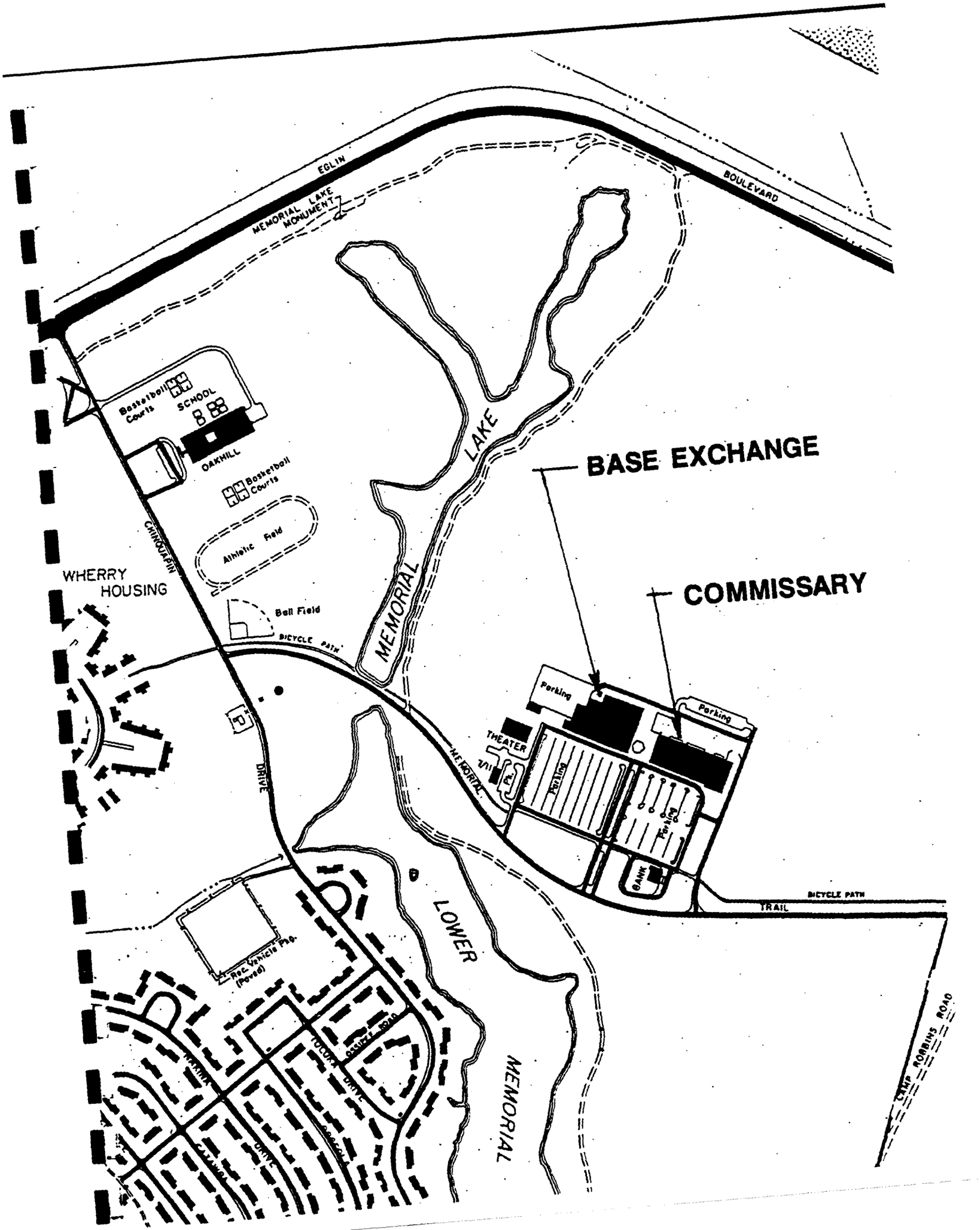
The warehouse is constructed on a shallow spread footing foundation and the floor is a concrete slab on grade. The interior structure is composed of precast concrete columns and beams. The north and south walls are load-bearing while the east and west walls are of non-load-bearing construction.

The existing sales and food processing areas amount to approximately 45,600 square feet and the warehouse is approximately 27,800 square feet for a total of approximately 73,400 square feet.

The main entrance to the site is centered between the commissary and the exchange building. The commissary's parking lot is located adjacent to the south side of the building and consists of approximately 400 spaces. All truck traffic is through the east service drive. The service drive serves both the commissary and the exchange for truck access and is the only access for the north parking area.

As a part of our original site investigation work, an asbestos study was made on the commissary. A copy of this report was included in the 35% Design Analysis and is included herein as Section X. As part of this contract modification, asbestos removal specifications will be prepared. These documents are to be delivered concurrently with the 90% Submittal.


PROJECT LOCATION
ALTERNATE SITE
CHOCTAWHATCHEE BAY


EGLIN
BOULEVARD
MEMORIAL LAKE MONUMENT
Basketball Courts
SCHOOL
OAKHILL
Basketball Courts
Athletic Field
CHINQUAPIN
WHERRY HOUSING
Ball Field
BICYCLE PATH
LAKE
MEMORIAL
BASE EXCHANGE
COMMISSARY
Parking
Parking
THEATER
Parking
Parking
MEMORIAL
DRIVE
BANK
BICYCLE PATH
TRAIL
LOWER
MEMORIAL
Rec. Vehicle Prg. (Paved)
CAMP ROBBINS ROAD

SECTION IV - SCOPE OF ALTERNATE SOLUTIONS

SECTION IV - SCOPE OF ALTERNATE SOLUTIONS

The six alternates listed below have been selected for study in this report. The commissary service has indicated its desire to retain the existing warehouse as part of the new commissary. It is with this thought in mind that one can look at the project as designed to create our study base line. We will then develop several additional schemes for this site. These alternates are those which we feel would meet the commissary service's requirements and budget. However, they are by no means the only options. We feel these alternates are those which are most feasible. One additional alternate is a clean site, which will be located away from the community facilities.

ALTERNATE NUMBER 1

Alternate Number 1 is based on the 35% Design Submittal and has been selected to provide a base line for this study. The 35% submittal was chosen because is establishes a common beginning or common element that is reconcilable to all of the groups that are responsible for the review of this report as well as those that are to determine the final direction for the project.

A new commissary sales area will be designed complete with its related processing areas and administration areas to the east of the existing warehouse. Additional parking will be added in front of the new commissary sales area. This plan will require two "off site" construction items. The first is remote retention ponds in one of two different locations. The second is an access drive to the west of the exchange.

ALTERNATE NUMBER 2

The building configuration used in Alternate Number 2 is the same as that used in Alternate No. 1. However, in an effort to avoid conflict with the landfill, the location of the sales area entrance and the parking lot have been altered. All other factors will be the same as those detailed for Alternate No. 2.

ALTERNATE NUMBER 3

Alternate No. 3 is the first major redesign of the commissary. In this plan the sales area is designed to be added to the south of the existing warehouse. The truck docks would be relocated to the east of the existing warehouse, additional parking would be added by demolishing the existing commissary sales area, and a new retention pond would be constructed to the north of the existing pond.

ALTERNATE NUMBER 4

In this alternate the existing sales area is demolished and a new commissary is constructed in its place. The existing warehouse is reused

resulting in a final layout much like the current arrangment. The parking lot will be expanded and the retention pond will be enlargec.

ALTERNATE NUMBER 5

Alternate Number Five is undoubtedly the most radical of the six plans. The plan is to construct a new commissary north of the existing warehouse. The parking will be provided on the site of the existing sales area and the retention pond will remain as is.

ALTERNATE NUMBER 6

A site opposite of the armament museum and north of Lewis Turner Boulevard has been selected by the Base as an alternate site for a new commissary.

SECTION V - DESCRIPTION OF ALTERNATES

SECTION V - DESCRIPTION OF ALTERNATES

This study will address six alternate approaches to a design of a commissary for Eglin Air Force Base. These alternates have been chosen because they represent the most viable approaches to the problem. In some cases, the alternate solution creates new problems that must be resolved. In other cases, the overall effect of the alternate results in changes to the surrounding facilities. Each of these problems and changes will be explained and resolved to a level that will insure that, if chosen, the alternate is feasible. Each alternate included in the planning study will address the following:

I. DESCRIPTION OF SITE

- A. Relationship of the new construction to the existing buildings
- B. Traffic
  - 1. Entry/Exit requirements and changes
  - 2. Traffic flow through site
  - 3. Truck access
- C. Parking
  - 1. Counts
  - 2. Relationship to entry
  - 3. Effect of construction
- D. Drainage/Retention Pond
  - 1. Status of the existing pond
  - 2. New ponds sites
  - 3. Constraints of each site
- E. Impact of landfill

II. Description of the New Construction

- A. Materials and Architecture
- B. Square footages of major functions
- C. Impact of the planned construction on the surrounding buildings
- D. Phasing of the construction process

III. Cost Information

IV. Conclusions

V. Graphics and References

A. Site plans for each alternate will be located at the back of each retained description of an alternate.

ALTERNATE NUMBER ONE

I. DESCRIPTION OF THE SITE

A. RELATIONSHIP OF THE NEW CONSTRUCTION TO THE EXISTING BUILDINGS

As has been stated, this alternate is the same as the information given in the 35% submittal. In that submittal the new commissary sales and food processing areas are planned to be located to the east of a small addition to be added to the east side of the warehouse. In essence, flipping the building and its operations from a west to east layout of sales/food processing - warehouse, to one of warehouse - sales/food processing. The new construction would extend approximately 450 feet to the east of the existing building.

The existing commissary sales/food processing building would be closed off from the warehouse and turned over to the base for other uses.

Operationally, the commissary would function in much the same way that it operates today. The patron entry and exits would be from the south side of the building directly to the parking area. Deliveries would be received on the north side of the existing warehouse as well as the new warehouse. The administration functions would be housed adjacent to the sales and the warehouse.

B. TRAFFIC

The existing access to the site will remain in place with all automotive accesses via these points. The eastern entry is currently the service access drive for the entire complex. A new service access drive is planned to be constructed on the extreme western edge of the community facilities that will replace the existing service drive. This new access drive will provide a distinct separation between truck and automobile traffic. The separation of truck and automobile traffic will ease access problems and improve safety.

C. PARKING

The existing parking area consists of 330 spaces for patrons and 60 spaces dedicated to the employees. An additional 350 spaces will be constructed to the east of the existing parking area. The completed parking area will provide approximately 740 parking spaces, of which 25% would be within a 300-foot radius of the entry.

The relationship of the patron access to the parking and the facilities will not be altered. However, the traffic flow within the site will be improved by the arrangement of the expanded parking area. The traffic loop around the existing parking will be extended and modified to include the new parking. This will aid the smooth flow of traffic through the parking areas.

D. DRAINAGE/RETENTION POND

Because of the location of the new building and the expanded parking area, the existing retention pond must be filled in. This is to provide the available site area for the planned construction. As a result of the loss of the existing pond, and due to the layout of the building on the site, two new retention ponds must be constructed. One pond will be located south of Memorial Trail, directly across from the main entrance and will be approximately one acre in size (1.5 acre feet). The second will be to the northeast of the new commissary building. It is estimated to require between one and four acres of area.

Both pond sites share a common problem - that is, the topography of the area limits the type of ponds that can be used. For a complete explanation of the ponds and their requirements, see Section IX, Engineering Study and Chapter VIII Supplemental Geotechncial Studies for additional information.

E. IMPACT OF SANITARY LANDFILL

The location of the sanitary landfill will impact the planned construction in two areas. As currently sited, the southeast corner of the building will be located approximately 50 feet from the edge of the landfill. Although the building does not represent a direct infringement on the landfill, the proximity of the construction could create a situation where the landfill is disturbed. The recommendation of this report is to include a warning to the general contractor that this situation exists and that it will be a requirement of the contract for contractor to protect the landfill from any harm. Alternately, the landfill could be abated by a separate contract to a distance that will ensure an adequate work space.

The second conflict with the landfill is the planned extension of the parking area. As can be seen on the site map (refer to site plan that follows this narrative), approximately 35% of the new parking area is to be constructed over the landfill. Two design methods can be used to construct the parking, as shown. The first is to design a concrete 'cap' over the landfill and then construct the parking on

this cap. The second design method is to abate the site, thereby creating a 'clean' site for the construction. Please refer to the reports provided by Jammal Associates, and included as part of this report. These reports give more detailed information and recommendations concerning the landfill and the alternate solutions available.

It will be the recommendation of this report that the landfill be abated as necessary to allow for the planned construction of the parking lot. The additional cost of the abatement will be addressed in a latter part of the report.

II. DESCRIPTION OF NEW CONSTRUCTION

A. MATERIALS AND ARCHITECTURE

The new commissary addition will be constructed of several different materials. The front facade will be face brick with a metal stud backup. A canopy will front the checkout area and be constructed of architectural precast concrete with brick veneer columns. The canopy will shelter all entry and exit functions. The rear and sides of the commissary addition will be constructed of precast concrete panels.

A warehouse addition of 15,000 square feet will be constructed between the existing warehouse and the new sales area. A delivery corridor will extend the full length of the store behind the new food processing areas. All deliveries to the meat market, dairy area and the produce area will be via the delivery corridor. The food processing area, dairy, meat and produce is situated at the rear of the sales area. Between the new warehouse addition and the main sales area is a series of spaces that provide secure storage, breakrooms, employee toilets and a cool storage area.

A mechanical mezzanine is located over the above-mentioned storage area. This mezzanine will house all HVAC and refrigeration equipment. An administrative area will be adjacent to the storage area and located between the warehouse and the sales area.

A checkout area is planned to be built in front of the sales area. Offices, storage and entry/exit functions are located between the checkout area and the front canopy.

B. The Square Footage Breakdown Is As Follows:

1.	EXISTING WAREHOUSE	27,800	SQUARE FEET
2.	WAREHOUSE EXPANSION	15,900	SQUARE FEET

3.	FOOD PREPARATION AREA	18,000	SQUARE FEET
4.	SALES	37,400	SQUARE FEET
5.	CHECKOUT	5,300	SQUARE FEET
6.	ADMINISTRATION	3,900	SQUARE FEET
7.	CANOPIES	1,800	SQUARE FEET
8.	MECHANICAL/ELECTRICAL SPACES	7,500	SQUARE FEET

With only minor changes this is a valid description and square footage totals for the new construction for all of the alternates. Only variations will be noted on the other alternates.

C. IMPACT OF THE CONSTRUCTION

In its completed form, the project will have limited negative impact on the existing community facility. In fact, the only negative feature is the location of the entry. Because it is located at the extreme eastern end of the facility, the travel distance from the exchange to the commissary is too great for most people. This will result in more internal vehicular movement as patrons move their cars from the area of the exchange to the area of the commissary.

During construction the daily operations of the commissary and the surrounding buildings will be affected to a limited extent. The primary area of conflict will be the work required in the existing parking area. It will be necessary to close a great deal of the parking to install a new storm water drainage system. Secondary impacts to the operations will include:

*Interference with the warehouse operations while the additions are constructed.

*Interference with the delivery side of the commisary due to construction of the retention pond.

*Normal utility conflicts

D. PHASING

Phasing may be accomplished in the following manner:

1. Construct the truck access road, the retention ponds, and site drainage.

2. Abate or cap landfill area in parking lot.

3. After completion of drainage work, fill in existing pond and begin construction of the new addition.

4. Construct parking lot.

5. Complete renovation of the existing warehouse.

6. Transfer operations to new facility

The construction should have minimal impact on the existing commissary operations.

III. COST INFORMATION

COST ITEM	UNITS	COST/UNIT	TOTAL COST	
SITE IMPROVEMENTS*		$	$	
DEMOLITION	1 ea	9,806	9,804	
EARTHWORK	1 ea	114,904	114,904	
STORM DRAINAGE	1 ea	107,544	107,544	
UTILITIES	1 ea	63,013	63,013	
PAVING	1 ea	829,642	829,642	$ 1,124,909
BUILDING DEMOLITION				
RELATED TO ADDITION	1 js	240,318	240,318	
OF OTHER STRUCTURES	0	0	0	$ 240,318
COMMISSARY				
SALES/FOOD PROCESSING	71,900 sf	55	3,954,500	
WAREHOUSE/STORAGE (EXT)	27,812 sf	25	695,300	
WAREHOUSE/STORAGE (NEW)	15,914 sf	35	556,990	
MECH/ELECT SPACE	7,500 sf	15	112,500	
EQUIPMENT	1 ea	1,000,000	1,000,000	$ 6,319,290
ABATEMENT				
LANDFILL	1 js	300,000	300,000	
ASBESTOS FOR CONSTRUCTION	1 js	95,000	95,000	
ASBESTOS FOR DEMOLITION	0	0	0	$ 395,000
		TOTAL COST	$8,079,517	

* INCLUDES COST OF RETENTION POND

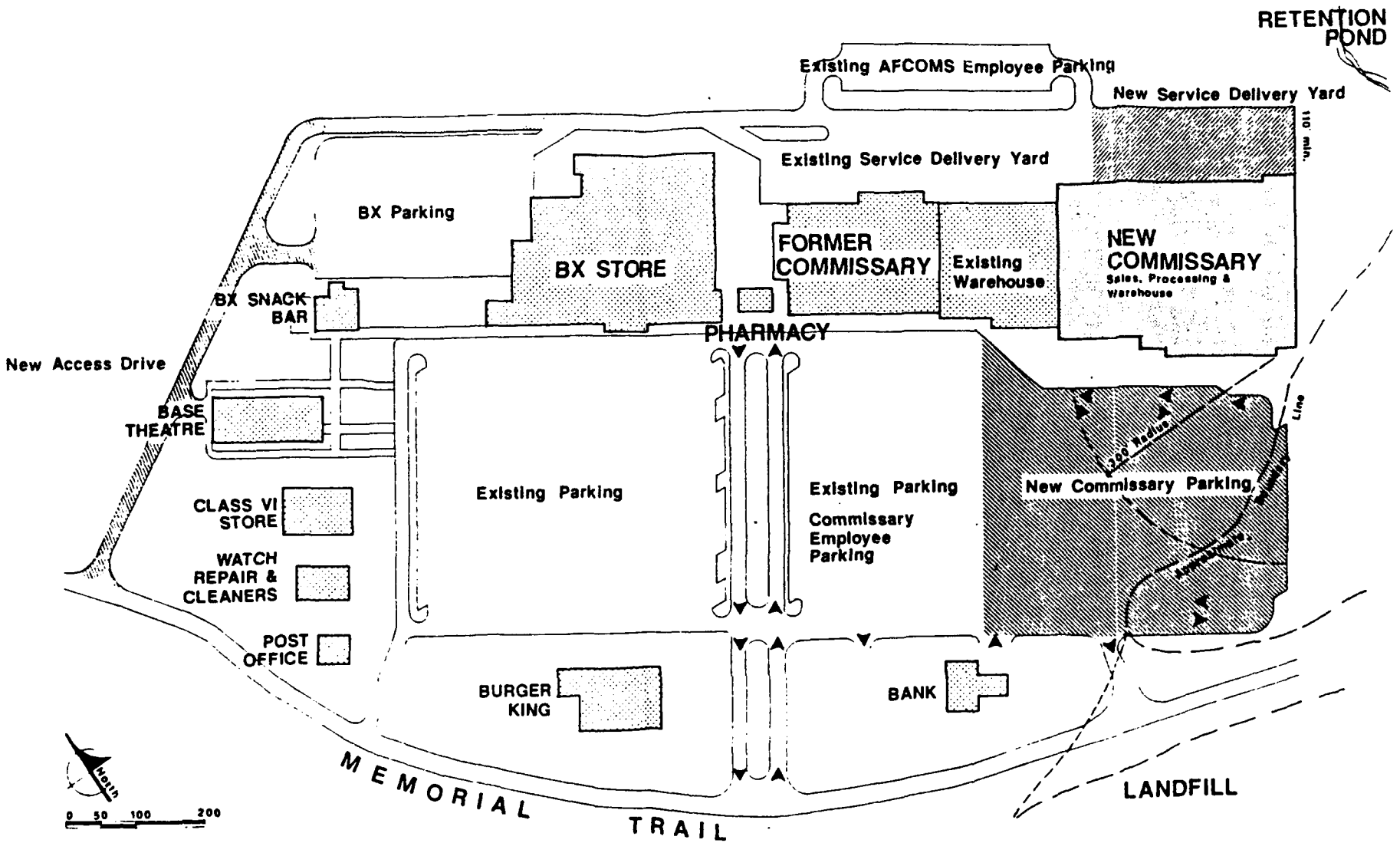
IV. CONCLUSIONS

Alternate Number 1 has a number of advantages. These advantages are as follows:

- All the work is to be done in one phase. Impact on present commissary operations are minimal.
- All existing structures are to remain for future use.
- Adequate parking is available upon completion.
- Project is already in the design phase. This alternate can be completed between eighteen months and two years sooner than any other alternate. The time difference can give the commissary service up to twenty-four months of increased revenue over other alternates.
- Cost of alternate is lower than alternates three through six.
- All existing parking is to remain.

The disadvantages for this alternate are as follows:

- Long strung-out pedestrian circulation
- The retention ponds are relocated off site (two required)
- Parking infringment of the landfill (abatement of the landfill or capping the landfill can overcome this problem)



ALTERNATE NO. 1

RETENTION POND

ALTERNATE NUMBER TWO

I. SITING OF THE NEW CONSTRUCTION

A. RELATIONSHIP OF NEW CONSTRUCTION TO THE EXISTING BUILDINGS

Alternate Number Two is a slight modification of Alternate Number One. It involves only two significant changes.

1. The first is that the entrance would be shifted to the opposite (west side) of the patron check out. This would result in the interior of the sales and food preparation areas being flipped 180 degrees and the relocation of the mechanical mezzanine. These are design problems which can be resolved without a great deal of difficulty.

2. The parking expansion would be reduced to avoid conflicting with the landfill site.

B. TRAFFIC

·The traffic patterns for entry and exit of the site will be the same as Alternate Number One.

C. PARKING

·390 existing spaces (60 employee)
·260 new spaces
·Approximately 40% will be within a 300' radius of entry
·Impact on parking similar to Alternate No. One

D. RETENTION POND

·Similar to Alternate Number One

E. The landfill will not affect this alternate. The parking lot has been reduced to miss the area of the landfill.

II. DESCRIPTION OF NEW CONSTRUCTION

A. ·Similar to Alternate Number One.

B. ·Similar to Alternate Number One.

C. ·Similar to Alternate Number One.

D. ·Phasing is similar to Alternate No. One.

III. COST INFORMATION

COST ITEM	UNITS	COST/UNIT	TOTAL COST	
SITE IMPROVEMENTS*				
DEMOLITION	1 ea	$ 9,806	$ 9,806	
EARTHWORK	1 ea	114,904	114,904	
STORM DRAINAGE	1 ea	109,032	109,032	
UTILITIES	1 ea	63,013	63,013	
PAVING	1 ea	763,284	763,284	$ 1,060,039
BUILDING DEMOLITION				
RELATED TO ADDITION	1 js	240,318	240,318	
OF OTHER STRUCTURES	0	0	0	$ 240,318
COMMISSARY				
SALES/FOOD PROCESSING	71,900 sf	55	3,954,500	
WAREHOUSE/STORAGE (EXT)	27,812 sf	25	695,300	
WAREHOUSE/STORAGE (NEW)	15,914 sf	35	556,990	
MECH/ELECT SPACE	7,500 sf	15	112,500	
EQUIPMENT	1 ea	1,000,000	1,000,000	$ 6,319,290
ABATEMENT				
LANDFILL	0	0	0	
ASBESTOS FOR CONSTRUCTION	1 js	95,000	95,000	
ASBESTOS FOR DEMOLITION	0	0	0	$ 95,000
		TOTAL COST	$7,714,647	

* INCLUDES COST OF RETENTION POND

IV. CONCLUSIONS

The advantages are as follows:

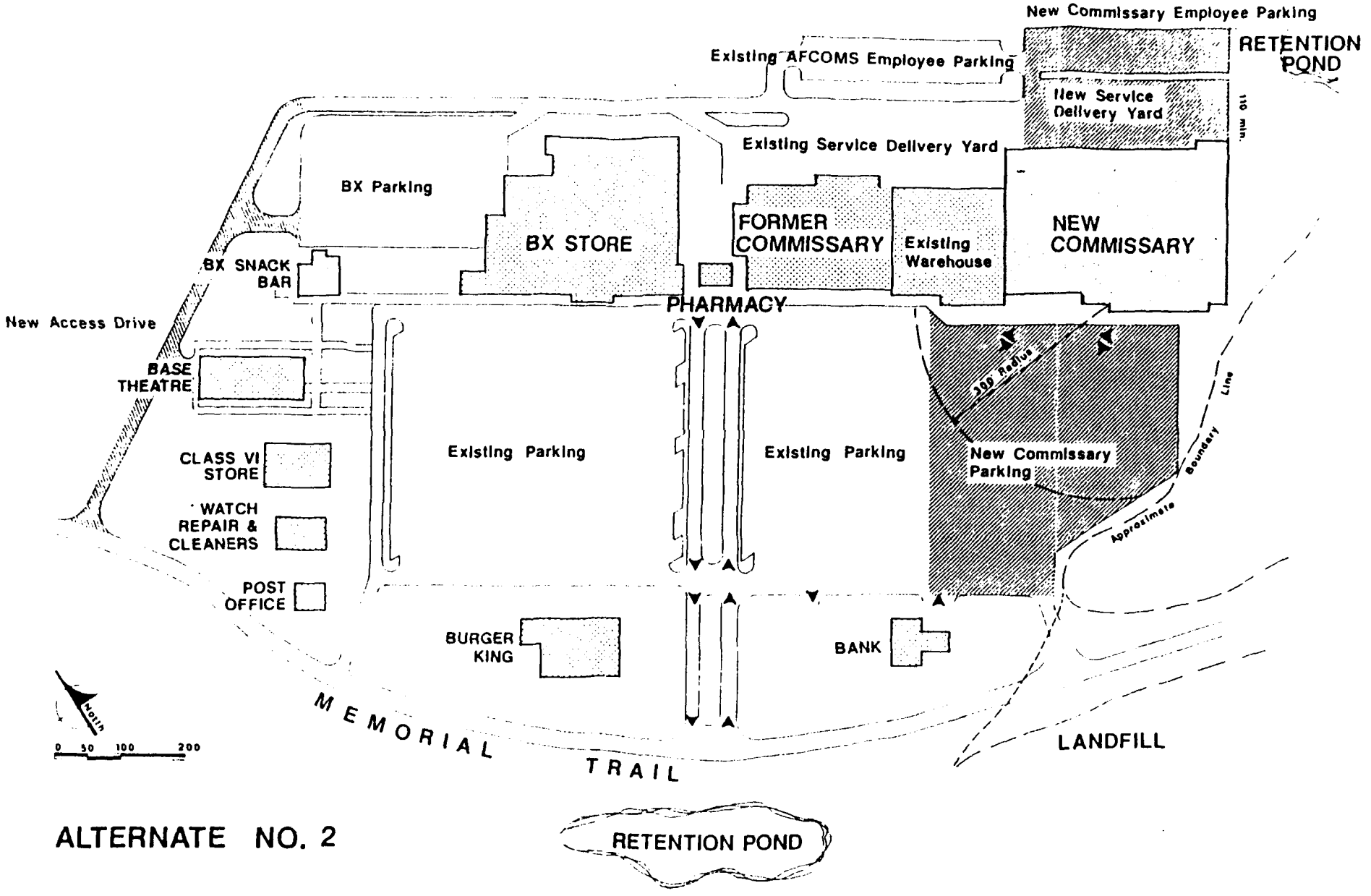
- All work can be done in one phase.
- All structures are to remain for future use.
- Construction will not impact the landfill.

The disadvantages are as follows:

- Reduces parking in number of spaces and accessibility.
- Increases distance to entry and exits.

·Redesign of interior could delay project six months to a year.

·Ketention ponds are relocated off site.



ALTERNATE NO. 2

ALTERNATE NUMBER 3

I. DESCRIPTION OF SITE

A. RELATIONSHIP OF THE NEW CONSTRUCTION TO THE EXISTING BUILDINGS

Alternate No. Three is the first major departure from the base line established by Alternate Number One. Alternate No. 3 turns the new construction 90· to the south and will extend approximately 350 feet into the existing parking lot.

This alternate calls for the demolition of the existing commissary building and the satellite pharmacy. Construction of a new satellite pharmacy will be treated as a portion of the new facility. The pharmacy can be incorporated into the design solution with a minimum of problems.

The existing canopy and walkway would be retained and extended to connect with the new construction. This will provide a continuous protected walkway between the existing exchange and the new commissary.

B. TRAFFIC

All existing entries to the site will remain in place. The new access road will provide truck access to the exchange as well as patron access to both the exchange and the new commissary parking lot.

The major flow of traffic to the site will be from the main and southeast entrances off of Memorial Trail. The entrances allow traffic to access a perimete drive designed to facilitate the flow of traffic through the site.

Truck access to the commissary will be via the east entry/exit drive. The service drive will provide access to a new truck loading area which will be constructed to the east of the new commissary. The loading area will accommodate all deliveries to the new facility.

C. PARKING

The existing parking lot will have to be reworked for this alternate. The drainage will be routed to the south of the new commissary building. The reworked parking area will provide 156 spaces. A new patron parking area to the south of the new sales area will provide another 50 parking spaces and a new parking lot to be constructed on the old commissary

site will contain another 270 spaces. A separate lot will be constructed to the north of the existing warehouse for employee parking and will have 180 spaces. Approximately 65% of the patron parking will be within 300 feet of the entrance.

Construction of the parking lot will have a great deal of impact on the operation of the existing commissary during construction. Special attention to phasing will be required to keep the impact to a minimum.

D. DRAINAGE AND RETENTION PONDS

The existing pond will be filled in and a new pond will be constructed to the east of the new loading area. The new pond will be located on a clean site that will not interfere with the sanitary landfill.
Storm drainage from both sides of the building will have to be rerouted to the new pond site via storm drain lines and culverts.

E. IMPACT OF LANDFILL

There is no conflict with the landfill area created by this alternate.

II. DESCRIPTION OF THE NEW CONSTRUCTION

A. MATERIALS AND ARCHITECTURE

Alternate Number Three is similar to the previous alternates in materials and design.

B. SQUARE FOOTAGES OF MAJOR FUNCTIONS

Size and relationship of the major functions is similar to the previous alternates.

C. IMPACT OF THE CONSTRUCTION

There are several positive aspects to be considered. Among these are:

- Reuses the existing warehouse
- Does not interfere with the sanitary landfill.
- Consolidates the community facility.

There is a great deal of negative impact on the commissary and the community facility. Some of the problems are short

term associated with the construction while others are a result of the layout and operations of the commissary.

The short term negative impacts are:

- The parking area currently in use be the commissary patrons will be closed for the duration of the construction period.

- Access to the loading area in front of the commissary will be restricted during the construction period.

- The warehouse operations will be hampered during various stages of the construction.

- Construction of the retention pond will interfere with the commissary's daily operations.

- Demolition of the existing commissary will impact parking as well as operations.

The long term negative impacts are:

- This plan is based on the "flipped" plan discussed in Alternate Number Three. All of the shortcomings discussed on Alternate Number Three that result from the arrangement of the plan, apply to this alternate.

- Reduced parking available.

D. PHASING

Phasing may be accomplished in the following manner:

1. Construct the access road.

2. Construct warehouse addition, loading docks and access ramps for the docks to the east of the existing warehouse.

3. Construct new sales addition and renovate the existing parking area including drainage and the retention pond.

4. Transfer operations to the new facility.

5. Demolish the existing commissary and satellite pharmacy.

6. Construct the remainder of the patron parking and the new employee parking lots.

III. COST INFORMATION

COST ITEM	UNITS	COST/UNIT	TOTAL COST	
SITE IMPROVEMENTS*				
DEMOLITION	1 ea	$ 40,503	$ 40,503	
EARTHWORK	1 ea	126,663	126,663	
STORM DRAINAGE	1 ea	92,372	92,372	
UTILITIES	1 ea	39,373	39,373	
PAVING	1 ea	1,068,828	1,068,828	$ 1,367,739
BUILDING DEMOLITION				
RELATED TO ADDITION	1 js	375,000	375,000	
OF OTHER STRUCTURES	102,000 cf	1.15	117,300	$ 492,300
COMMISSARY				
SALES/FOOD PROCESSING	72,900 sf	55	4,009,500	
WAREHOUSE/STORAGE (EXT)	27,812 sf	25	695,300	
WAREHOUSE/STORAGE (NEW)	24,600 sf	35	861,000	
MECH/ELECT SPACE	7,500 sf	15	112,500	
EQUIPMENT	1 ea	1,000,000	1,000,000	$ 6,678,300
ABATEMENT				
LANDFILL	0	0	0	
ASBESTOS FOR CONSTRUCTION	1 js	95,000	95,000	
ASBESTOS FOR DEMOLITION	1 js	215,000	215,000	$ 310,000
		TOTAL COST	$8,848,339	

* INCLUDES COST OF RETENTION POND

IV. CONCLUSIONS

The advantages are as follows:

- Construction avoids landfill.
- More compact design not strung-out on site.
- Only one new retention pond required.

The disadvantages are as follows:

- Phasing will be difficult.
- Parking will be inaccessible for an extended period of time.

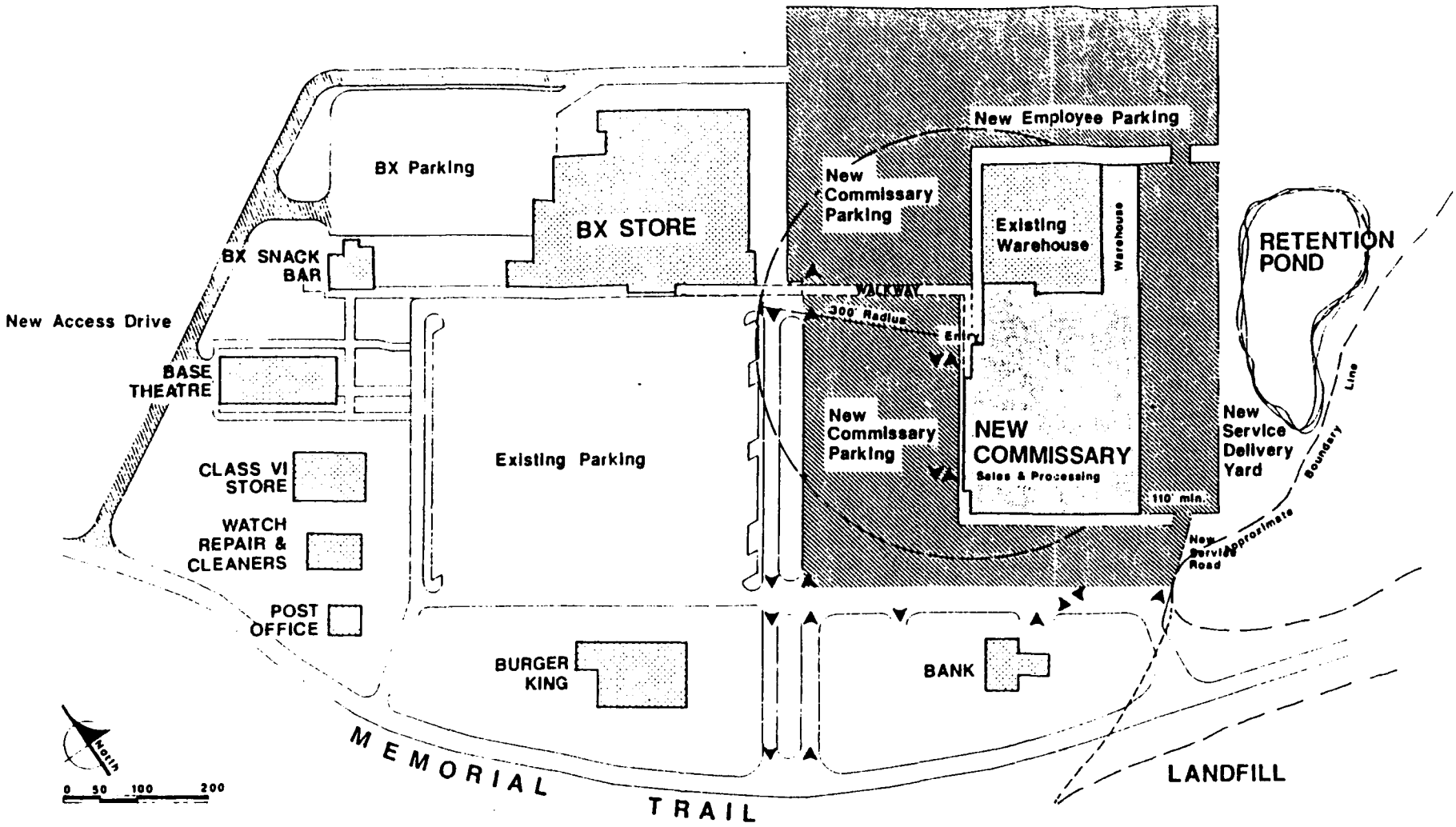
·Construction problems with warehouse. This alternate would call for removal of a loadbearing wall (increased cost).

·Existing commissary and satellite pharmacy to be demolished.

·Cost of asbestos abatement of the existing building added to the project.

·Construction of interferes with operation of the existing facility.

·Cost increases.



ALTERNATE NO. 3

ALTERNATE NUMBER 4

I. DESCRIPTION OF THE SITE

A. RELATIONSHIP OF THE NEW CONSTRUCTION TO EXISTING BUILDINGS

Alternate Number 4 is a further departure from Alternate Number 1. The new sales/processing area is to be constructed in the place of the existing commissary sales. Alternate Number 4 calls for the internal plan to be flipped similar to Alternate Number 2 with the entry next to the warehouse functions. However, this is not mandatory and was done only to increase the number of parking spaces within a 300 foot radius.

As configured, this alternate calls for the demolition of the existing commissary building and the satellite pharmacy building. Construction of a new satellite pharmacy will be treated as a portion of the new facility. The pharmacy can be incorporated into the design solution with a minimum of conflicts.

B. TRAFFIC

Entry and exit from the site will remain unchanged. Traffic flow through the site will be remarkably similar to Alternate Number 1.

All truck access to the site will be accomplished via the new access road on the west side of the complex. Both the exchange and the commissary will be serviced by this access road thus separating patron and truck traffic.

C. PARKING

The existing parking lot of 390 spaces will be retained. A parking lot addition of 132 spaces will be added to the east of the existing lot. A new employee parking lot of 160 spaces will be constructed on the northeast corner of the warehouse addition. Approximately 70% of the parking is within 300 feet of this entry. The construction of the additional parking will have a minimal effect on commissary operations.

D. DRAINAGE/RETENTION POND

Alternate Number 4 reuses the existing retention pond. Some minor adjustments to site drainage from the rear of the site will have to be made. The adjustments would include the use of culverts and storm drains to channel water from the rear of the site to the retention pond.

E. IMPACT OF LANDFILL

Alternate Number 4 has no impact on the landfill.

II. DESCRIPTION OF NEW CONSTRUCTION

A. MATERIALS

- Similar to Alternate Number 1

B. SQUARE FOOTAGES OF MAJOR FUNCTIONS

- Size and relationship similar to Alternate Number 1

C. IMPACT OF CONSTRUCTION

Construction of this alternate will have a major impact on commissary operations. The construction of the new store will require the demolition of the existing store. The construction would require the use of the existing warehouse as a sales area. Deliveries would also be hampered by a lack of accessibility and storage area.

- Preparations will have to be made for temporary facilities for meat preparation (on or off site).

- Temporary facilities for meat sales to be provided.

- Temporary facilities for frozen food storage and sales will have to be provided.

- Temporary sales area shelving and lighting installed.

- Temporary checkout facilities will need to be constructed.

- Temporary entrances and exits will have to be provided.

D. PHASING

1. Construct the truck access road.

2. Construct the warehouse additions and the loading ramps to within 10 feet of the new commissary.

3. Modify the warehouse for sales operations and transfer the commissary operations to the warehouse.

4. Demolish the existing commissary.

5. Construct the new commissary building.

6. Construct the parking lot additions and the employees parking lots.

Demolition of the existing building will have a tremendous impact on the project phasing. The warehouse sales situation will call for coordination and cooperation between the contractor and operator to keep commissary operations functioning. Temporary facilities will have to be installed in a timely manner and commissary deliveries adjusted to provide continuous service without adequate warehouse space.

III. COST INFORMATION

COST ITEM	UNITS	COST/UNIT	TOTAL COST	
SITE IMPROVEMENTS*				
DEMOLITION	1 ea	$ 24,554	$ 24,554	
EARTHWORK	1 ea	34,470	34,470	
STORM DRAINAGE	1 ea	44,707	44,707	
UTILITIES	1 ea	24,881	24,881	
PAVING	1 ea	841,867	841,867	$ 970,479
BUILDING DEMOLITION				
RELATED TO ADDITION	1 js	415,000	415,000	
OF OTHER STRUCTURES	102,000 cf	1.15	117,300	$ 532,300
COMMISSARY				
SALES/FOOD PROCESSING	72,900 sf	55	4,009,500	
WAREHOUSE/STORAGE (EXT)	27,812 sf	25	695,300	
WAREHOUSE/STORAGE (NEW)	34,600 sf	35	1,211,000	
MECH/ELECT SPACE	7,500 sf	15	112,500	
EQUIPMENT	1 ea	1,000,000	1,000,000	
OTHER COST**	1 js	350,000	350,000	$ 7,378,300
ABATEMENT				
LANDFILL	0	0	0	
ASBESTOS FOR CONSTRUCTION	1 js	95,000	95,000	
ASBESTOS FOR DEMOLITION	1 js	215,000	215,000	$ 310,000
		TOTAL COST		$9,191,079

* INCLUDES COST OF RETENTION POND

** LIST COSTS:
1. Cost of Temporary Equipment
2. Cost Associated with the Phasing of the Construction
3. Cost of Temporary Patron Access and Protection
4. Cost to the Commissary of Lost Sales, etc. Is Not Included

IV. CONCLUSIONS

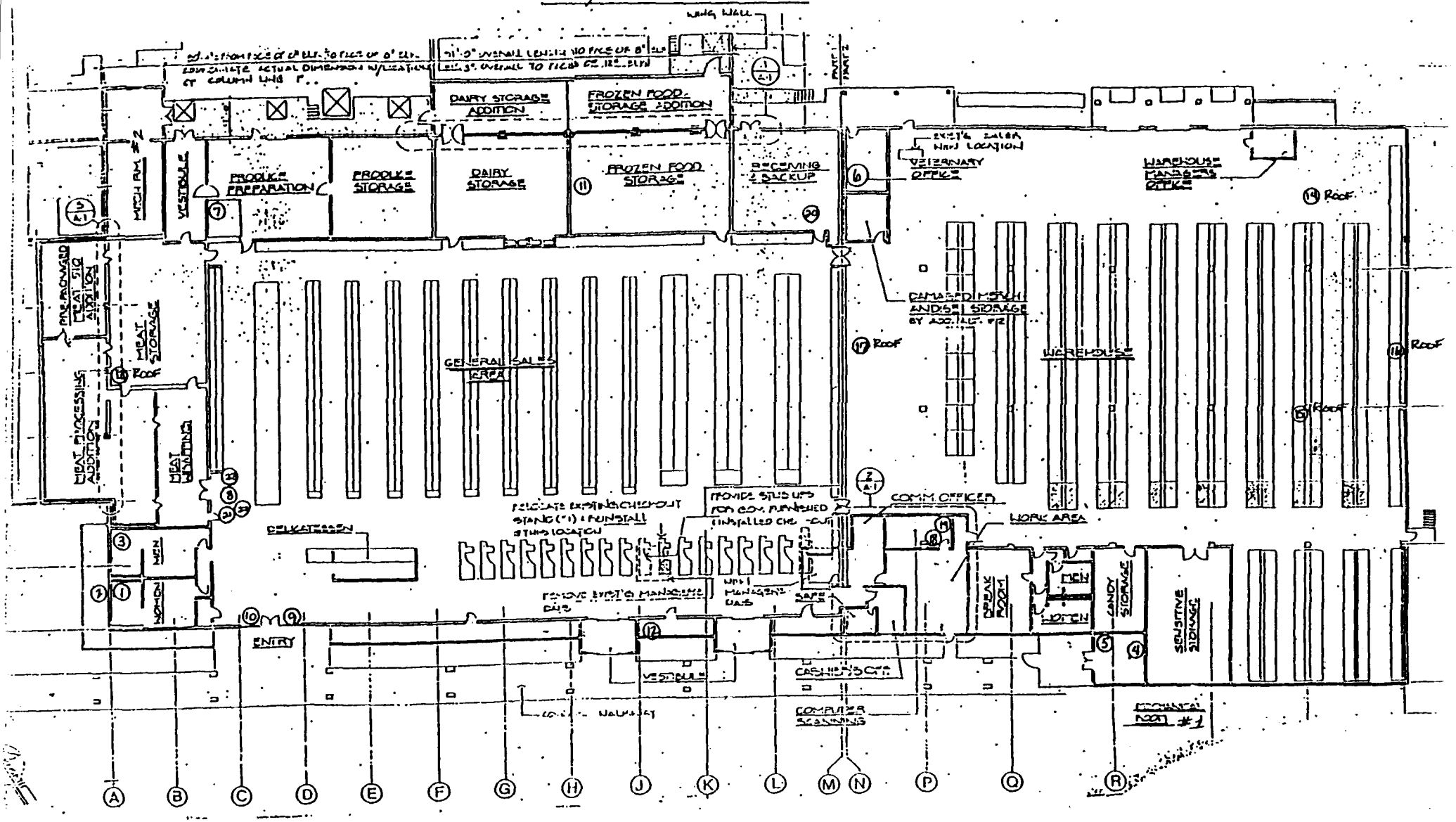
The advantages of Alternate Number 4 are as follows:

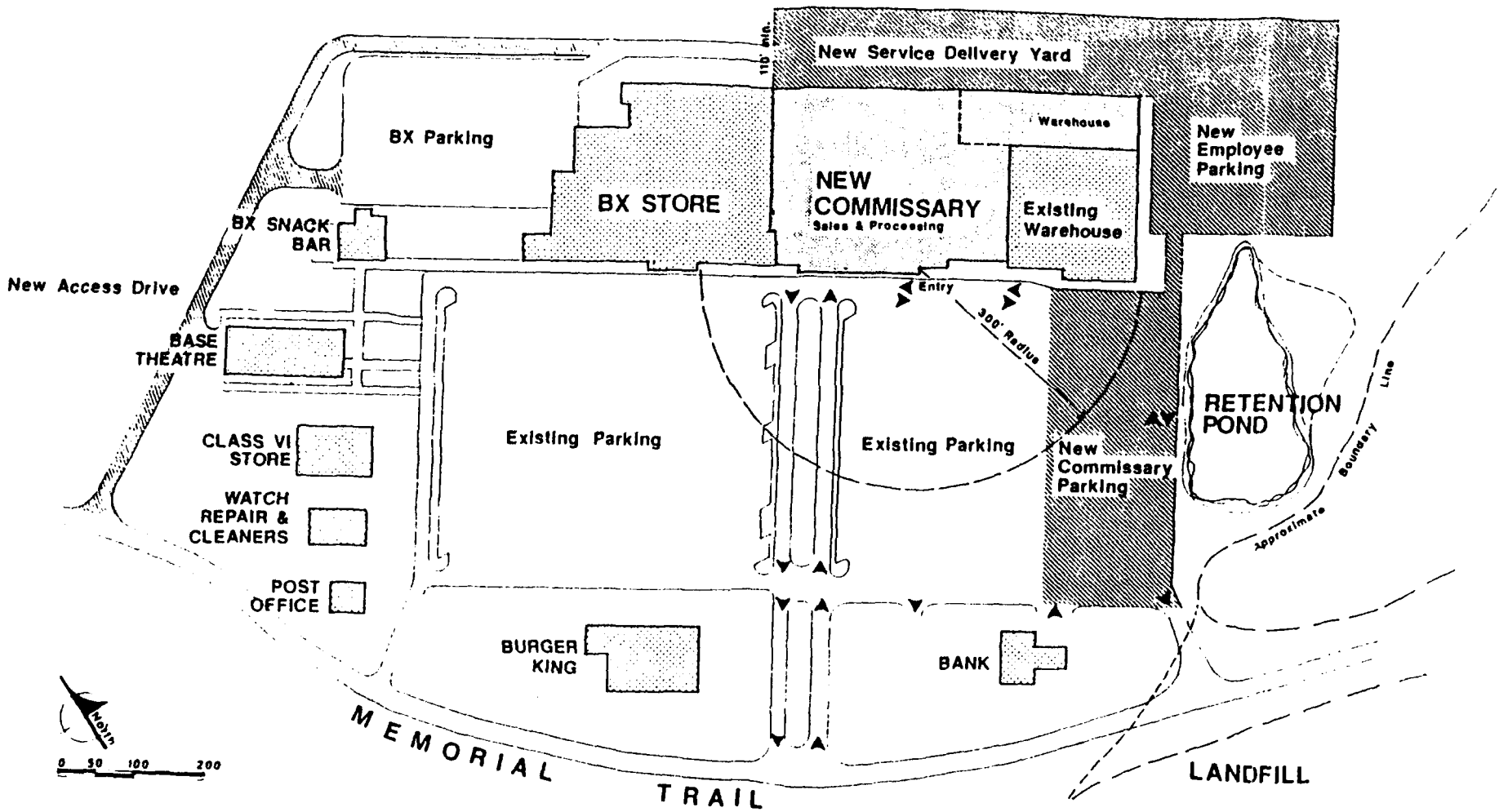
- Retention pond and landfill to remain untouched.
- Entry/exits in close proximity to parking.
- Reduces walking distances.

The disadvantages of this alternate are more numerous and are as follows:

- Requires demolition of existing commissary and satellite pharmacy.
- Requires warehouse sales area during construction.
- Warehouse storage space will be non-existent during construction.
- Cost of project will increase.
- Reduces Parking
- Heavy impact on store operation during construction.
- Approximately one year delay in completion of project.

SAMPLE LOCATIONS





ALTERNATE NO. 4

ALTERNATE NUMBER 5

I. DESCRIPTION OF THE SITE

A. RELATIONSHIP OF THE NEW CONSTRUCTION TO THE EXISTING BUILDING

Alternate Number 5 breaks ground in a new direction. The sales area would be constructed to the north side of the existing warehouse and awarehouse addition would be constructed to the east side of the existing warehouse. A new truckyard would be constructed to the east side of the new building which would allow all deliveries to be handled from the east side of the building.

As has been stated in the two previous alternates, the existing commissary store and satellite pharmacy would have to be demolished. The existing walkway would remain and be extended to meet the new building.

B. TRAFFIC

- Traffic flow similar to Alternate Number 4.

- Truck access similar to Alternate Number 3.

C. PARKING

The existing parking lot of 390 spaces will be retained with an additional 340 patron spaces to be constructed to the north of the existing lot. The employees will have a new parking lot of 120 spaces located to the east of the existing parking area.

Construction of this plan will impact commissary operations. Operations will be severely restricted during demolition of the existing commissary. Careful phasing will be required to provide an orderly changeover.

D. DRAINAGE/RETENTION POND

- The existing pond will be reused.

- Site modifications are required to bypass the new building and channel storm water to the existing pond via a new route.

E. IMPACT OF THE LANDFILL

- Alternate Number 5 will not impact landfill.

II. DESCRIPTION OF NEW CONSTRUCTION

A. MATERIALS AND ARCHITECTURE

- Similar to Alternate Number 2.
- Reversed store plan similar to Alternate Number 2.

B. SQUARE FOOTAGE

- Similar to Alternate Number 1.

C. IMPACT OF CONSTRUCTION ON SURROUNDING BUILDINGS

- Similar to Alternate Number 2.

D. PHASING

1. Construct access road.
2. Construct warehouse addition and truck yard.
3. Construct new sales area.
4. Complete employee parking lot and truck yard.
5. Build temporary partition in existing sales at line of first roof truss ± 25' to west of warehouse. Demolish first 25' of building.
6. Transfer operations to new building.
7. Demolish existing commissary and complete parking lot.

Phasing will be difficult during the transfer of operations period. Delays in entry and loading can be expected. This will have an impact on sales figures for a period of one hundred twenty days or more.

III. COST INFORMATION

COST ITEM	UNITS	COST/UNIT	TOTAL COST	
SITE IMPROVEMENTS*				
DEMOLITION	1 ea	$ 24,358	$ 24,358	
EARTHWORK	1 ea	124,172	124,172	
STORM DRAINAGE	1 ea	95,329	95,329	
UTILITIES	1 ea	37,888	37,888	
PAVING	1 ea	1,076,952	1,076,952	$ 1,358,699
BUILDING DEMOLITION				
RELATED TO ADDITION	1 js	375,000	375,000	
OF OTHER STRUCTURES	102,000 cf	1.15	117,300	$ 492,300
COMMISSARY				
SALES/FOOD PROCESSING	72,900 sf	55	4,009,500	
WAREHOUSE/STORAGE (EXT)	27,812 sf	25	695,300	
WAREHOUSE/STORAGE (NEW)	24,600 sf	35	861,000	
MECH/ELECT SPACE	7,500 sf	15	112,500	
EQUIPMENT	1 ea	1,000,000	1,000,000	
OTHER COST	1 js	350,000	350,000	$ 7,028,300
ABATEMENT				
LANDFILL	0	0	0	
ASBESTOS FOR CONSTRUCTION	1 js	95,000	95,000	
ASBESTOS FOR DEMOLITION	1 js	215,000	215,000	$ 310,000
		TOTAL COST	$9,189,299	

* INCLUDES COST OF RETENTION POND

IV. CONCLUSIONS

The advantages are as follows:

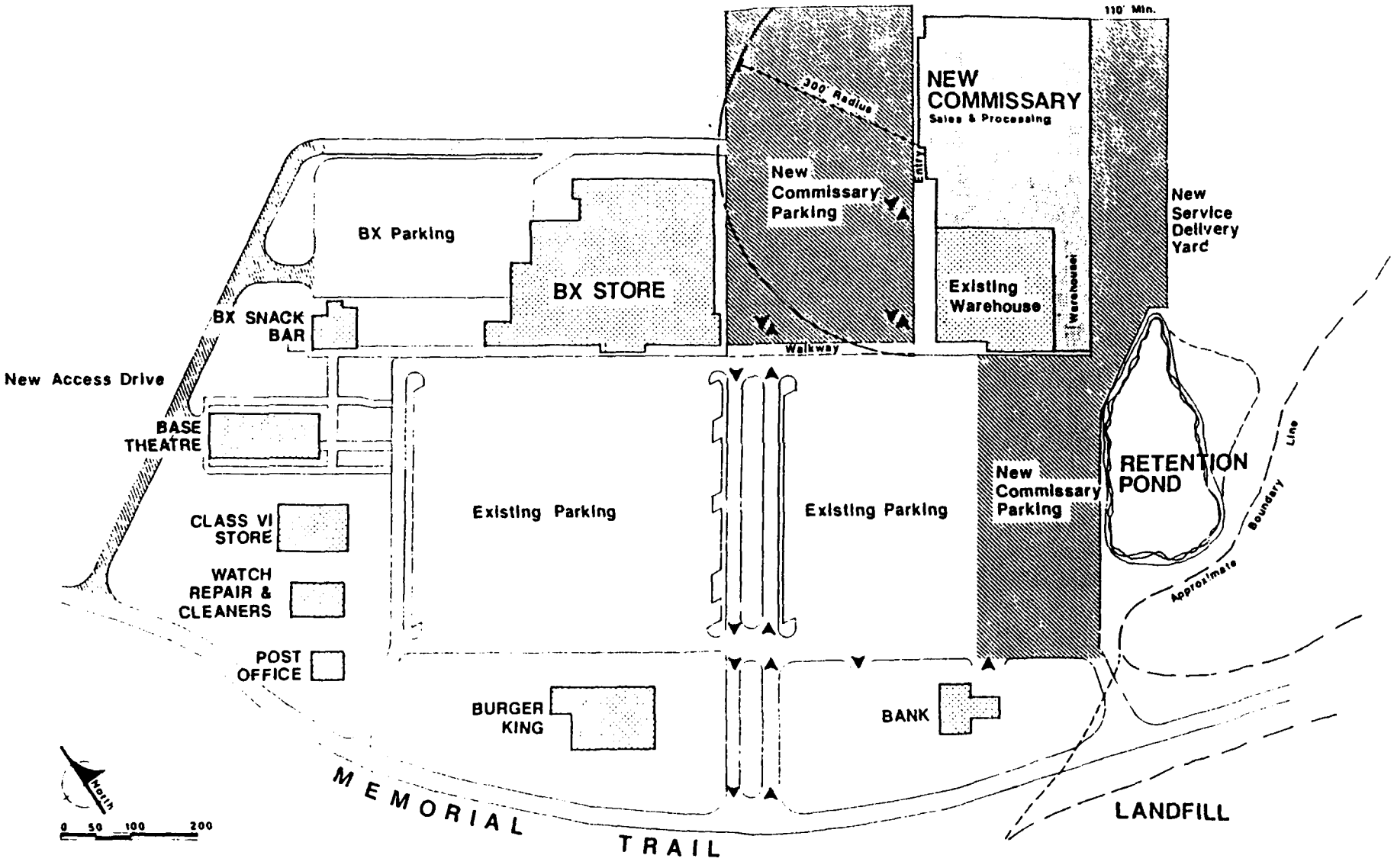
- Construction avoids landfill
- Compact layout
- Existing pond to remain

The disadvantages are as follows:

- Demolition of existing commissary and satellite pharmacy.
- Cut and fill necessary as this alternate cuts into grade north of the existing facility.

- Conflict between operation of new store and demolition of existing would impact sales.

- Phasing of the transfer of operations will be difficult. May require closing of store during demolition of existing facility.



ALTERNATE NO. 5

ALTERNATE NUMBER 6

I. DESCRIPTION OF SITE

A. Alternate Number 6 is the control alternate of a remote site. The alternate bears a strong resemblance to Alternate Number 1 without the balance of the community service center. As indicated by the graphics, this alternate is a stand alone building. The facilities available on the original site will not be incorporated into this site.

B. The sales area and warehouse face onto the parking with a rear service delivery yard. The parking is entered through the main entry to the west of the site. A circulation road surrounds the parking.

All truck access will be through the east service entry.

C. PARKING

- Approximately 600 spaces for patron parking.
- Sixty percent of parking with 300 feet of entry.
- Employee parking of 120 spaces at rear.
- No effect on construction.

D. DRAINAGE/RETENTION POND

- Site requires a new pond.
- All surface drainage to flow into pond.

E. IMPACT OF LANDFILL

- Site is remote from the landfill. The landfill has no impact on this site.

II. DESCRIPTION OF NEW CONSTRUCTION

A. MATERIALS AND ARCHITECTURE

- Similar to Alternate Number 1.

B. SQUARE FOOTAGE TOTALS

- Similar to Alternate Number 1.

C. IMPACT OF CONSTRUCTION ON SURROUNDING BUILDINGS

*Remote Site/No Impact

D. PHASING

Alternate Number 6 is a stand alone building with no operation phasing required. The contractor should complete the facility and the commissary service would transfer operations to the new site.

III. COST INFORMATION

COST ITEM	UNITS	COST/UNIT	TOTAL COST	
SITE IMPROVEMENTS*				
DEMOLITION	1 ea	$ 9,800	$ 9,800	
EARTHWORK	1 ea	115,000	115,000	
STORM DRAINAGE	1 ea	50,000	50,000	
UTILITIES	1 ea	75,000	75,000	
PAVING	1 ea	1,200,000	1,200,000	$ 1,449,800
BUILDING DEMOLITION				
RELATED TO ADDITION	0	0	0	
OF OTHER STRUCTURES	0	0	0	$ 0
COMMISSARY				
SALES/FOOD PROCESSING	71,900 sf	55	3,954,500	
WAREHOUSE/STORAGE (EXT)	0 sf	25	0	
WAREHOUSE/STORAGE (NEW)	44,000 sf	35	1,540,000	
MECH/ELECT SPACE	7,500 sf	15	112,500	
EQUIPMENT	1 ea	1,000,000	1,000,000	$ 6,607,000
ABATEMENT				
LANDFILL	0	0	0	
ASBESTOS FOR CONSTRUCTION	0	0	0	
ASBESTOS FOR DEMOLITION	0	0	0	$ 0
		TOTAL COST	$8,056,800	

* INCLUDES COST OF RETENTION POND

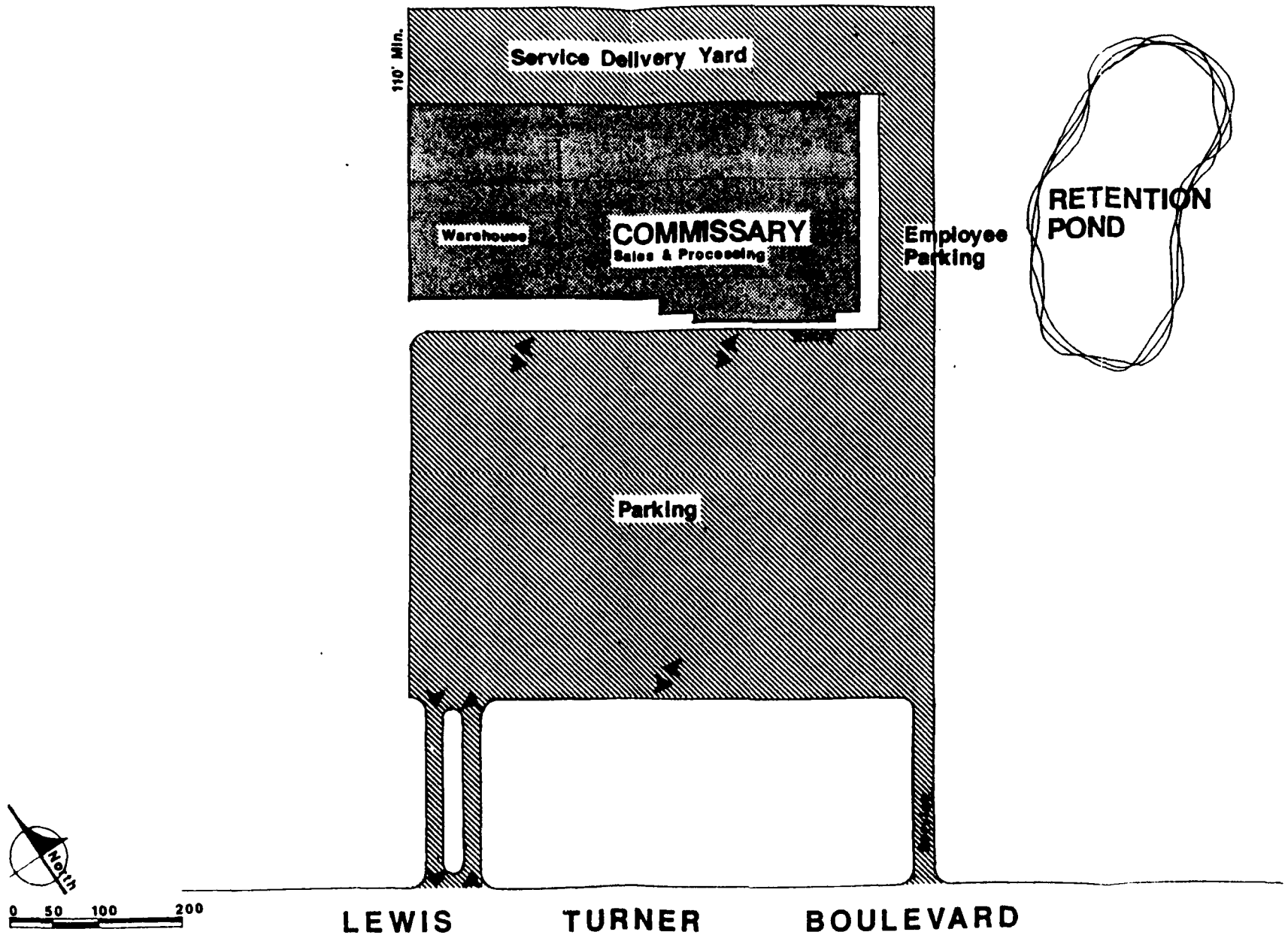
IV. CONCLUSIONS

The advantages are as follows:

- Easy transfer of operation - no phasing problems.
- No landfill conflicts.

The disadvantages are as follows:

- Increase cost of new warehouse.
- Increase in parking lot costs.
- One year delay in completion.
- The existing warehouse will be abandoned rather than revised.



ALTERNATE NO. 6

SECTION VI - CONCLUSIONS AND RECOMMENDATIONS

SECTION VI CONCLUSIONS

Alternate Number 1 is recommended as the best candidate for construction of all the alternates. The alternate has several problems to deal with. However, it rates as the most favorable choice for the following reasons:

- Alternate Number 1 can be constructed without impacting commissary operations. The store can remain in operation throughout the entire construction period with relatively few problems.

- Estimated cost of this alternate is less than any other alternate.

- The Base would be the beneficiary of the existing sales area for community activities.

- The cost of abating the landfill under the parking area will be less than the cost of the demolition of the existing structure.

- Cost of A/E services through the 35% design would be lost.

The reasons stated above support the recommendation of this report for abating the landfill under the parking lot and continuing the project as currently designed.

The balance of the alternates should be considered in the following order:

2. Alternate Number 2 - The major disadvantages are reduced parking and extended construction completion.

3. Alternate Number 6 - The problem with this alternate is the cost of construction and the empty buildings (warehouse) which will be left behind.

4. Alternate Number 3 - The major disadvantages are impact on operations, demolition phasing, and cost.

5. Alternate Number 5 - The major disadvantages are similar to Alternate Number 3.

6. Alternate Number 4 - The major disadvantages are operation problems, demolition and costs.

SECTION VII - ORIGINAL GEOTECHNICAL STUDY
(JAMMAL AND ASSOCIATES)

JAMMAL & ASSOCIATES, INC. Consulting Engineers

August 2, 1987
Project No. 89-31570

TO: A. S. Komatsu & Associates, Inc.
P.O. Box 2079
Fort Worth, TX 76113

Attention: Mr. Jim Clark

SUBJECT: Foundation and Soils Study
Proposed Commissary Addition
Eglin Air Force Base

Dear Mr. Clark:

In accordance with your request, we have completed a subsurface soil exploration, an evaluation of the soil stratigraphy, and an assessment of appropriate foundation support for the commissary addition site, Eglin Air Force Base, Pensacola, Florida. Included were Standard Penetration Test borings in the proposed addition area and hand auger borings in the proposed parking and retention areas to check continuity of shallow soil conditions. Based on the subsurface data, foundation pavement support conditions were evaluated.

Briefly, the results of our analyses indicate the proposed single-story steel frame/tilt wall building addition can be supported on conventional shallow foundations after proper subgrade preparation. A slab-on-grade can also be used. Important considerations in site preparation will be dewatering, cleaning and filling the existing retention pond/low area; compaction to densify loose, near surface sands, and the buried debris which extends near the building and into the parking area. Use of a powerful heavy vibratory compactor is not recommended near the existing building.

The following report presents the results of our study and includes our evaluation of the soil and groundwater conditions encountered, and our subsequent recommendations. Our environmental or contamination assessment study is being compiled and submitted under separate cover.

We have very much appreciated the opportunity to be a part of this project. If you have any questions about this report or if we can be of further service to you, please do not hesitate to contact our office.

Sincerely,

JAMMAL & ASSOCIATES, INC.

John R. Marquardt, P.E.
Vice President
Tampa Regional Manager

JRM/kms

Attachment: Sheets 1 and 2
Plate 1-5

A. S. Komatsu & Associates
Project No. 89-31570

PURPOSE AND SCOPE

This study was performed to obtain information on the subsurface conditions at the building and parking expansion site, in order to form an opinion of the soil stratigraphy and enable estimates of geotechnical properties. Based on the data, recommendations for each of the following were formulated:

1. Feasibility of utilizing the anticipated shallow spread foundation system for support of the structure. Suitability of a slab-on-grade.

2. Design parameters required for the foundation system, including allowable bearing pressures, foundation bearing levels, and expected settlements.

3. Site preparation requirements for foundation and slab support. Engineering criteria for placement and compaction of approved fill materials.

4. Suitability of materials on-site that may be moved during site grading for use as structural fill and general backfill.

5. General location and description of potentially deleterious materials indicated in the borings which may interfere with construction progress or structure performance, including existing fills, surficial organics, or plastic clays.

6. Critical design or construction details revealed by the boring program, including groundwater levels. Estimate seasonal high groundwater levels.

7. Pavement design considerations, recommended sections and base types, considering pavement subgrade types and expected traffic in light duty and heavy duty areas.

The work for this study involved field and laboratory testing, and an engineering evaluation of foundation and pavement support conditions. Specifically included were:

1. Conduct a general visual reconnaissance of the site.

2. Perform four (4) Standard Penetration Test (SPT) borings to a depth of approximately 20 feet and one (1) SPT boring to a depth of 50 feet in the proposed building addition area.

3. Conduct six (6) 5 foot deep hand auger borings in the proposed parking lot expansion, four (4) 5 foot deep auger borings along the northwest access road, and two (2) 5 foot deep auger borings in the new service delivery area.

4. Perform additional probes, hand auger borings, and visual observations to estimate the lateral extent of the landfill known to lie adjacent to the property.

5. Perform a series of probes and observations of the existing retention area to assess difficulties in cleaning and filling this area.

6. Visually classify all soil samples in the laboratory according to the Unified Soil Classification System. Conduct a limited laboratory testing program.

7. Form an opinion of the site soil stratigraphy. Carry out geotechnical engineering evaluation and analyses to develop recommendations in the above areas.

8. Prepare an engineering report describing the results of the study, including the results of field testing, laboratory classification, subsurface soil and groundwater conditions encountered, and our geotechnical engineering evaluation and recommendations for foundation design and site preparation for the proposed construction.

PROJECT DESCRIPTION

Proposed Construction

The commissary is located in a retail complex on the eastern side of the Eglin Air Force Base Family Housing Area, Pensacola, Florida. A layout of the area is provided on Sheet 1.

The new commissary addition is planned for the southeast side of the existing commissary, with the customer parking area expanded similarly. This is considered a light duty parking area. The delivery yard will be enlarged to extend behind the new addition. In addition, an access road on the opposite side of the complex is part of the project. These are likely heavy duty pavement areas. A new retention area is planned opposite Memorial Trail from the commissary parking lot expansion.

The proposed building will likely be tilt wall construction and steel frame. Based on past experience with similar construction, wall loads are anticipated to be relatively light, on the order of 3 to 4 kips per lineal foot. Column footings are expected to support about 50 kips.

Site Conditions

A drive passes just southeast and parallel to the existing commissary, and is flanked by a drainage swale. Further southeast, thick vegetation, including young sand pines, is present. The topography becomes undulating to the southeast. An irregular low area, apparently presently functioning as a retention basin, intrudes into the planned building area, and occupies much of the planned parking lot. Part of this area contained standing water. The approximate configuration of the retention area as estimated from our field observations is shown on Sheet 1. Again, land in the southeast area of the parking lot becomes undulating. Much of the higher area is vegetated with pines. The new retention area site also appears undulating, and covered with young pine trees.

An existing landfill designated the D-2 site is known to lie east and south of the subject site. Some information we were furnished in developing our proposal indicated this landfill was expected 300 to 500 feet away, but an initial site reconnaissance on June 28, 1989, raised the suspicion that the landfill was much closer to the study area, perhaps occupying part of the planned development.

SUBSURFACE EXPLORATION

To explore the general subsurface conditions for the building expansion, five (5) Standard Penetration Test (SPT) borings were performed, as previously described. The boring locations were adjusted to miss the existing road, and were selected around the existing retention area that were accessible to our truck mounted drill rig.

The SPT boring procedure was conducted in general conformance with ASTM D-1586. Closely spaced soil sampling using a 1-3/8 inch I.D. split-barrel sampler was performed in the upper 10 feet with a 5 foot sample interval used thereafter. The number of successive blows required to drive the sampler into the soil constitutes the test result commonly referred to as the "N"-value. The "N"-value has been empirically correlated with various soil properties and is considered to be indicative of the relative density of cohesionless soils and the consistency of cohesive soils. The recovered split spoon samples were visually classified in the field with representative portions of the samples placed in jars and transported to our Tampa office for review by the geotechnical engineer and confirmation of the field classification.

In addition, twenty (20) hand auger borings were conducted throughout the proposed paved areas and proposed retention sites. The hand auger borings were performed by manually pushing and twisting a bucket auger into the ground in approximately 6 inch increments. The soils recovered were sampled, logged, and classified by our field geologist.

Several probes and shallow hand augers also were made within the existing retention area and the undulating area suspected to possibly contain landfill.

Our personnel positioned the field tests using tape measurement and estimated right angles from the existing building and other site features, based on dimensions scaled from the site plan furnished for our use. The approximate location of the borings is shown on Sheet 1.

LABORATORY TESTING

The recovered soil samples were visually classified and stratified in the laboratory by the project engineer using the Unified Soil Classification System. Several soil samples were selected for gradation tests to measure their particle size distribution, including wash gradation to measure the percent passing the U.S. No. 200 sieve, or the silt and clay fines content. The amount of silt and clay in a soil affects its engineering properties, including permeability, consolidation behavior and suitability for fill. These tests were performed by passing the sample through a set of sieves with progressively smaller openings. The laboratory test data is presented on Plates 1 through 5.

SUBSURFACE CONDITIONS

Generalized Soil Conditions

The results of the subsurface exploration program including the stratification profile and some pertinent exploration information such as SPT "N" values and groundwater tables are graphically presented on Sheet 1. The stratification lines represent the approximate boundaries between soil types and the actual transition may be gradual. The soil strata were visually classified using the Unified Soil Classification System. Minor variations not considered important to our engineering evaluation may have been abbreviated or omitted for clarity.

Soil conditions at the site appear relatively uniform. According to the boring data, the site is generally covered with a thin surficial veneer of gray fine sand (Stratum 2), occassionally organic (Stratum 1). This is typically followed by orange-tan fine sand (Stratum 4). Occassional zones of brown fine sand (Stratum 6) and orange red silty fine sand (Stratum 3) also occurred at shallow depths. Below 2 to 6 feet, light tan to white fine sand (Stratum 5) was present. This soil continues to beyond 50 feet deep, based on the results of the deeper boring.

Some borings encountered buried debris (borings AB-9, AB-16, AB-18, and AB-20). In addition, several shallow probes and field observations were used to delineate expected areas of buried debris. The estimated limits of the buried debris are illustrated on Sheet 1. One boring within this area, AB-10, did not find debris. However, other evidence of landfilling was nearby. We expect the landfilling was thus done in an irregular or trench fashion.

Probes within the retention pond area found about 1/2 foot of surficial organic laden sand. Steve Veal with Carter and Burgess, Inc. performed a probe near the existing retention area during his site visit on June 28, 1989, which revealed a thin buried muck layer. Some standing water was observed within the low area. This water was estimated on the order of 3 feet deep at its deepest point.

Empirical correlations between Standard Penetration Test blowcounts and relative density indicate the sands to a depth of 7 to 10 feet are loose with some very loose zones. The lower sands are medium dense.

Groundwater Levels

The water table was found from about 2 to 7 feet deep in the borings after a short stabilization period, and was apparently dependent upon the ground elevation at the boring locations, as would be expected. Fluctuations in the groundwater level are expected with rainfall patterns, post construction influences

such as new retention area construction and low area filling, and other factors. Based on the soil stratigraphy and groundwater table found in the borings, we predict the normal wet season high groundwater table will be just slightly higher (1/2 to 1 foot) than levels reported herein. If important to design or construction, water levels could be monitored in the observation wells installed for groundwater sampling near the sites.

ENGINEERING EVALUATIONS AND RECOMMENDATIONS

Foundation Design Recommendations

Following acceptable site preparation (including stripping, compaction and cleaning and filling of the retention area) as described in the next section, the proposed single story addition can be supported on conventional shallow foundations. A net allowable foundation bearing pressure of 2500 psf or less should be used for design. Foundations should be founded on suitable and properly placed and compacted new sand fill or compacted natural ground as described below. Foundation embedment (depth to bottom of foundation) should be no less than 16 inches below adjacent grade on all sides. Excessive embedment (deeper than 24 inches) should be avoided to take advantage of the compaction process.

A minimum width of 20 inches is recommended for strip or wall footings, and isolated spread footings should be at least 36 inches square. The minimum foundation dimensions are intended to provide adequate size to accommodate minor variations in the bearing capability of the foundation subgrade soils, allow for small variations in the magnitude and distribution of the structural loads, and provide enough area to develop bearing capacity. The minimum footing sizes should be used regardless of whether or not foundation loads and allowable bearing pressures dictate a smaller size. To develop uniform foundation pressures, the structural elements should be centered on the foundations unless the foundations are proportioned for eccentric loads.

With the foundation design and subgrade preparation recommended herein, total settlements of isolated columns should not exceed 1-inch and total settlements of wall footings should not exceed 3/4-inch. Differential settlements should be approximately one-half of these amounts. Although it should be confirmed by the structural engineer, settlements of this magnitude are considered tolerable for the type construction planned. The proposed addition should not be rigidly connected to the existing building. New construction should be separated and allowed to settle independent of the existing building.

Subgrade and Fill Placement Recommendations - Building Area

The following are our recommendations for overall site preparation and compaction in the building area. These recommendations should be used as a guide for the project general specifications prepared by the design engineers and architects.

It would be desirable to use a heavy vibratory roller to achieve sufficient depth of compaction to densify most of the loose surficial sands and help control settlements. However, the existing building may be affected by such powerful compaction equipment. Accordingly, a program of compaction with a medium size vibratory compactor is recommended, except within one hundred (100) feet of existing structure, where smaller compactor such as a walk behind double drum roller is most appropriate. In addition, densification of the bottom of the foundation excavations with a small vibratory sled or impact compactor is recommended. Our recommendations are itemized as follows:

1. Strip, clear and grub surface and near surface deleterious materials and vegetation from the building area plus a 10 foot margin. The retention area should be dewatered and scraped clean as part of this process.

2. Shallow auger borings should be made five (5) feet outside the building limits about the southern building corner to check for buried unsatisfactory materials from past landfilling operations, and to

verify that foundation soils are as indicated in our borings. Additional hand auger borings should be made around the limits of the existing retention pond to check for buried organic soils also requiring removal.

3. Filling and/or other earthwork should not proceed until verification of sufficient stripping, clearing, and grubbing is made, the hand auger probes accomplished, and any excavation and removal of unsuitable materials is completed.

4. Compaction of the cleared retention area bottom and of any excavations should be performed. Wet conditions may necessitate placement of an initial lift of dry sand fill prior to compaction to enhance equipment trafficability. Backfilling should rapidly follow excavation to limit infiltration from groundwater seepage and avoid accumulation of rainfall runoff. Excessive soil loosening caused by groundwater inflow may necessitate wellpoint dewatering.

5. Compaction should be accomplished using a medium vibratory compactor with an impact force of about 20,000 pounds. Close to the building (within about 100 feet), a small compactor should be used (such as the double drum walk behind type). A minimum of 10 passes should be made in a criss-cross pattern over the excavated subgrade during the initial compaction, with compaction continuing until a minimum density of at least 95% of the modified Proctor (ASTM D-1557) maximum dry density is developed for a depth of 2 feet below the compacted surface. Compaction should take place at the level of the stripped or finished subgrade, whichever is lower.

6. Following satisfactory completion of the initial compaction, approved fill can be placed and compacted in 12 inch lifts to the same criteria. Fill materials should be clean fine sand free of unsuitable debris, with a percentage passing the No. 200 sieve of 10% or less. The water content of the soils may have to be adjusted to permit

satisfactory compaction. A moisture content within two percentage points of the optimum established by the modified Proctor test is recommended. With the exception of any debris, organic or root laden soils, the on-site sands are suitable for use as fill.

7. Footing excavations should be recompacted to densify soils loosened in the excavation process, and to obtain additional compaction considering the lighter compaction equipment necessary. Utility trench backfill or soils placed adjacent to footings or walls should be carefully compacted with a light rubber-tired roller or vibratory plate compactor to avoid damaging the footings or walls. Approved sand fills placed in footing excavations above the bearing level, in trench excavations, and in other areas which are expected to provide support should be placed in loose lifts not exceeding 6 inches and should be compacted to a minimum of 95% of the soils' maximum modified Proctor dry density.

8. A representative from Jammal & Associates, Inc. should be retained to monitor the site clearing, to evaluate the performance of the compaction equipment and response of the building subgrade during proof-rolling and perform the shallow auger borings. The field technician would also monitor the placement of approved fills and could provide compaction testing to avoid delays. Density tests should be performed in the natural ground subgrade and in each fill lift. Additional density tests should be made in the foundation excavation bottoms to verify that the desired effects of compaction have been achieved. It is important that Jammal & Associates, Inc. be retained to observe that the subsurface conditions are as we have discussed herein, and that foundation construction and fill placement is performed in accordance with our recommendations.

Pavement Design Considerations

Pavement design must consider leaving the landfill materials partially underlying the proposed area in place or removing them and backfilling with compacted fill. Completely removing the debris will obviously increase costs, a significant portion of which will be finding an acceptable disposal site. The primary difficulty in leaving the debris in place will be increased settlement and associated maintenance costs.

The most direct problem affecting pavement performance would be shallow weak or detrimental materials included in the fill within the depth of influence of wheel loads. Where weak materials occur close to pavement grade, pavement distortion and failure can occur under wheel load applications. Provided some small settlement and future maintenance is acceptable, it appears feasible and economically reasonable to locate and remove any near surface detrimental weak deposits rather than undertake complete excavation and replacement of the debris. Should this approach be taken, we recommend that a flexible pavement (limerock or shell base), which is most capable of tolerating some settlements, be utilized.

As a guideline for the heavy duty pavement design, considering semi-truck traffic and small forklifts, we recommend that the base course be a minimum of 10 inches thick for limerock and 12 inches thick for shell. The base can be six (6) inches thick in automobile parking areas, and eight (8) inches thick in automobile drives. Limerock or shell base materials should meet FDOT requirements (including LBR of 100), should be compacted to a minimum of 98% of the maximum modified Proctor dry density (AASHTO T-180) and should be firm and unyielding. The subgrade of a flexible pavement section should have a minimum Florida Bearing Value (FBV) of 75 psi or Limerock Bearing Ratio of 40 for a depth equal to the base thickness and should be compacted to a minimum of 95% of AASHTO T-180.

The asphaltic concrete wearing surface should consist of Type S-III asphaltic concrete meeting current Florida Department of Transportation specifications and placement procedures. A compaction level of 95% of the Marshall density of a sample of

the asphaltic concrete delivered to the site should be obtained. A minimum thickness of 1-1/2 inches is recommended in heavy duty areas and 1 inch in automobile traffic areas.

Actual pavement design should be performed by the project civil engineer considering these recommendations and the expected traffic.

Pavement Subgrade Preparation

If the debris is removed, and outside of buried debris areas, recommendations for the building area site preparation should be followed. Debris should be removed to 5 feet beyond the pavement limits or to a distance equal to its depth, whichever is greater, if this alternative is chosen. With the debris left in place, we anticipate subgrade preparation will include root raking, proof-rolling and significant surface compaction with a heavy vibratory roller. The following are our recommendations for site preparation for paved areas with buried debris left in place:

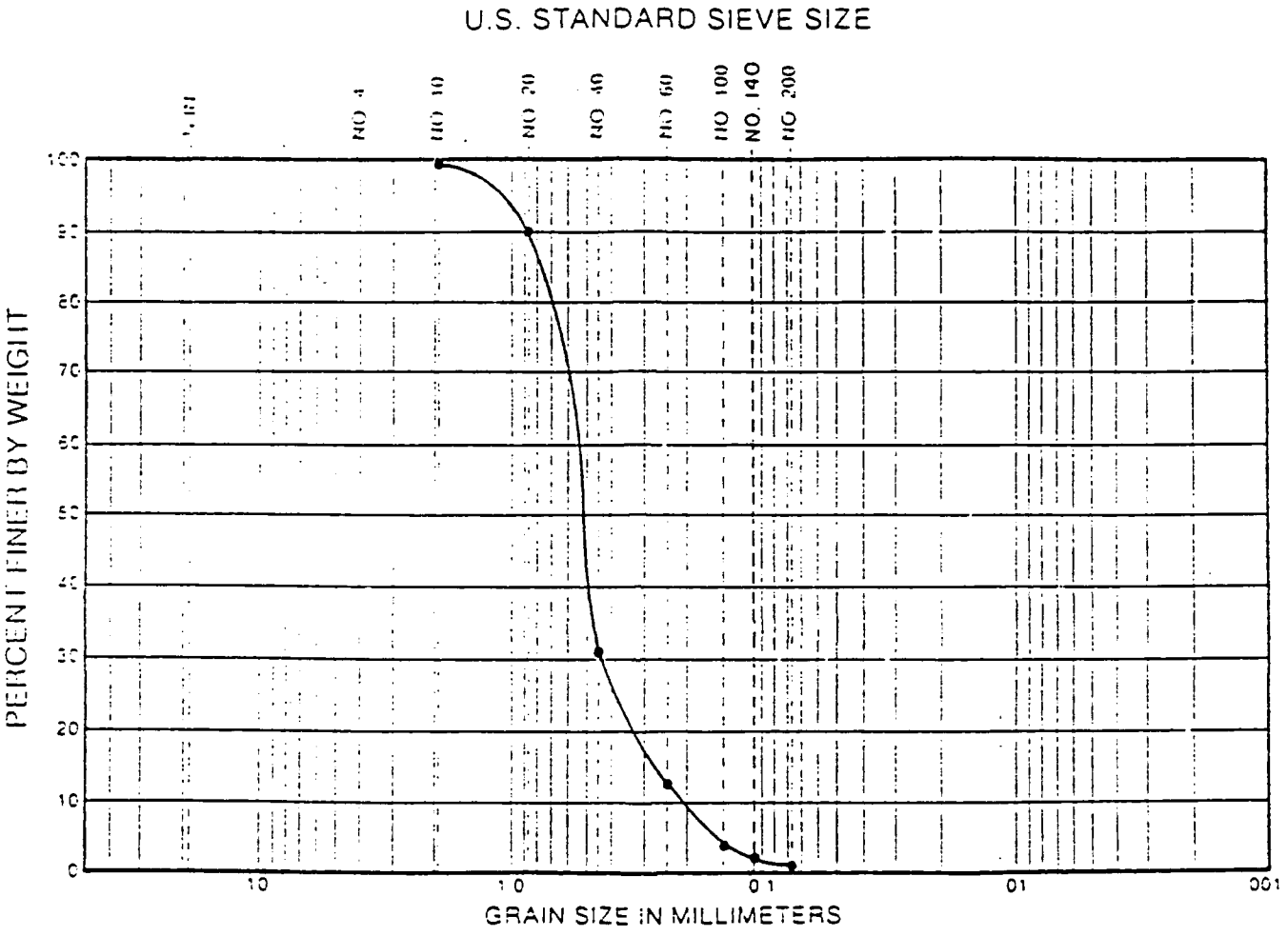
1. The site should be stripped of deleterious materials, cut to grade if necessary and the exposed surface root raked to remove near surface debris. After root raking, the surface should be compacted with a heavy vibratory roller with a minimum impact force of 35,000 pounds in a criss-cross pattern. Any surficial deposits of plastic clay, organic soils, or soft yielding areas discovered during stripping or proof-rolling should be excavated and removed.

2. The compacted surface should be proof-rolled with at least five passes of a fully loaded dump truck. Again, soft or yielding areas should be explored and undercut as necessary. (Existing sands may require stabilization prior to this step.)

3. Fill above existing grade should consist of clean fine sand free of roots, rubble, and debris. The fill should be placed and compacted in lifts not exceeding 12 inches. Each lift should be compacted to at least 95% of the modified Proctor dry density. To facilitate compaction, a moisture content with 2 percentage points of the optimum indicated by the modified Proctor test is recommended.

Limitations of Report

The analyses and recommendations submitted in this report are based upon the anticipated location and type of construction and the data obtained from the soil borings performed at the locations indicated and does not reflect any variations which may occur between these borings. If any variations become evident during the course of construction, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. When final design plans and specifications are available, a general review by our office is strongly recommended as a means to check that the assumptions made in preparation of this report are correct and that earthwork and foundation recommendations are properly interpreted and implemented.



UNIFIED SOIL CLASSIFICATION SYSTEM

LIQUID LIMIT : --
PLASTIC LIMIT : --
FINE THAN # 200: 1 %
CLASSIFICATION: (SP)

Sample Location: B-2
6-8 ft. deep

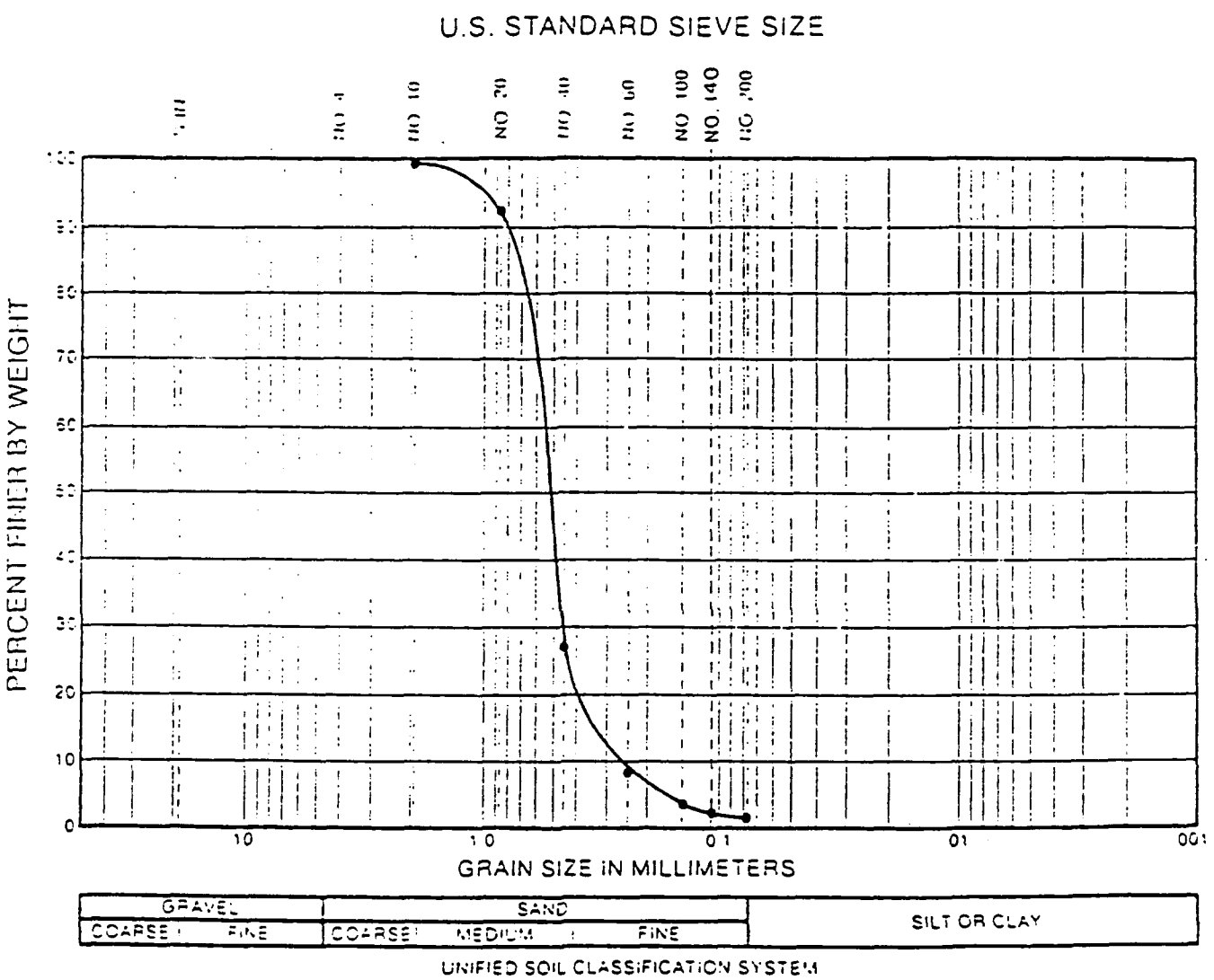
Sample Description: Tan fine sand

GRAIN SIZE ANALYSIS

EGLIN AIR FORCE BASE

JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by RAB	Tested by RLF	Project No 89-31570
Checked by JRM	Date AUG 89	Plate 1



LIQUID LIMIT : ---
PLASTIC LIMIT : ---
FINE THAN # 200: 1%
CLASSIFICATION: (SP)

Sample Location: B-4
8-10 ft. deep

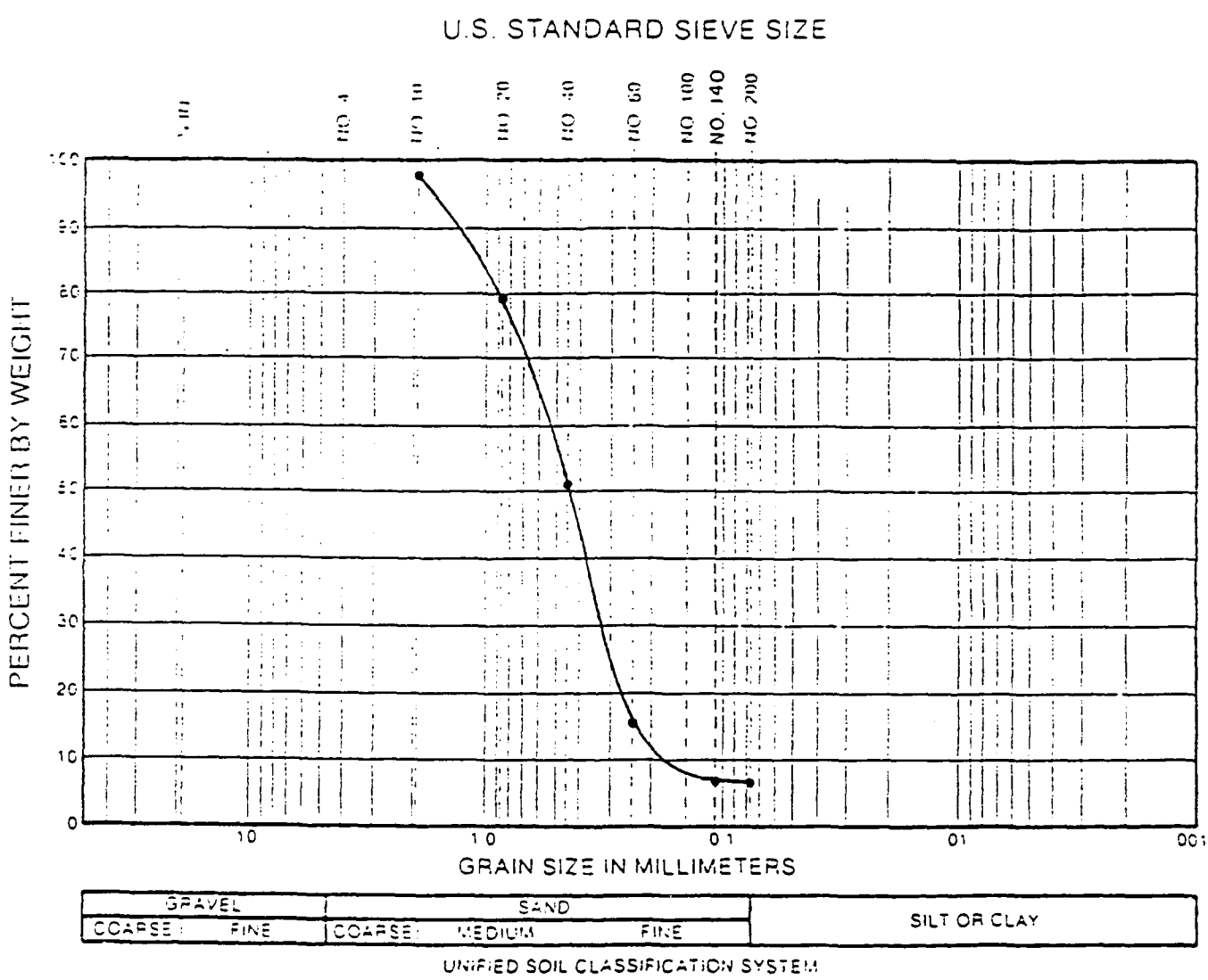
Sample Description: Light tan fine sand

GRAIN SIZE ANALYSIS

EGLIN AIR FORCE BASE

JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by RAB	Tested by RLF	Project No 89-31570
Checked by JRM	Date AUG 89	Plate 2



LIQUID LIMIT : ---
PLASTIC LIMIT : ---
FINE THAN # 200: 5%
CLASSIFICATION: (SP)

Sample Location: B-5
0-2 ft. deep

Sample Description: Yellow fine sand

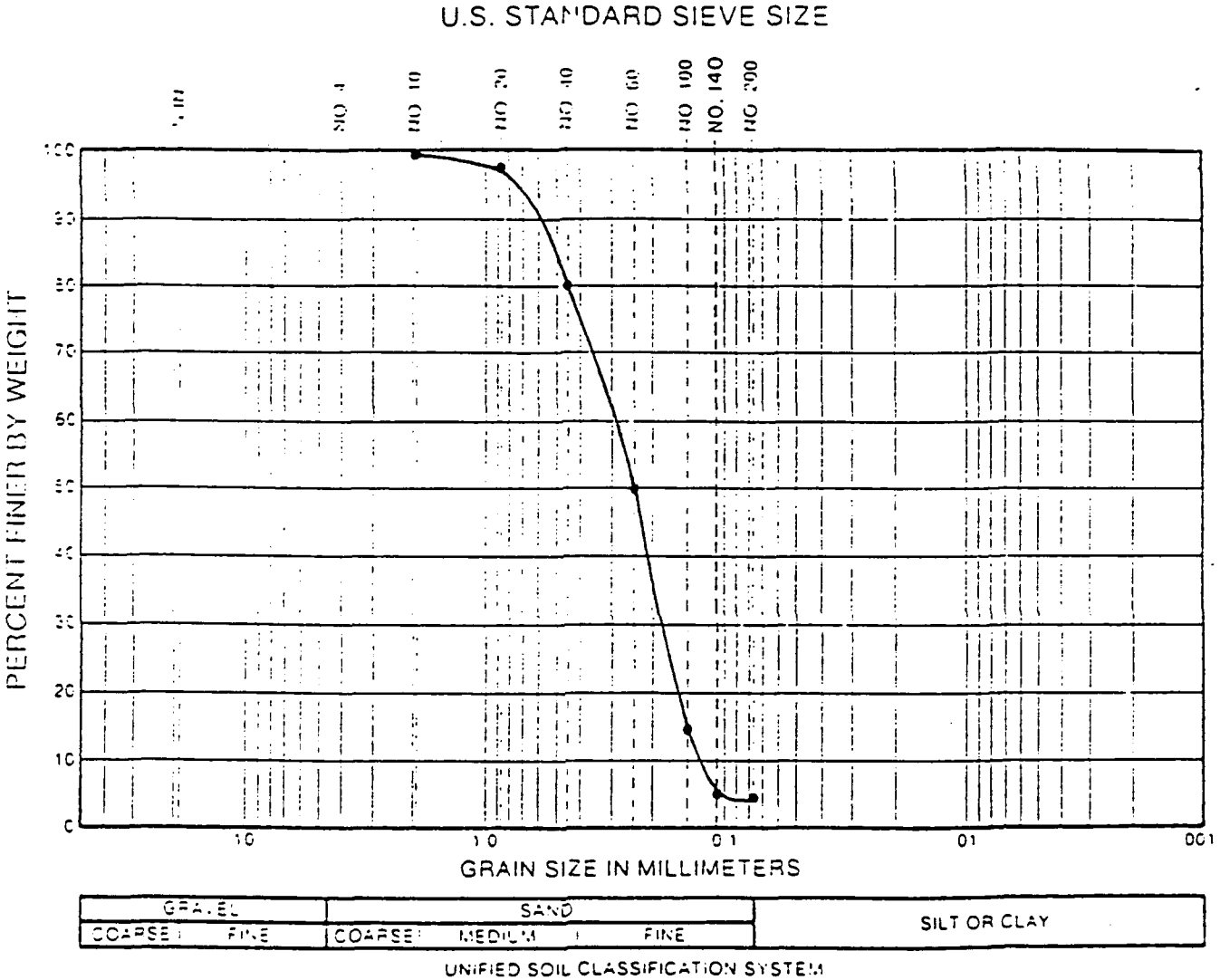
GRAIN SIZE ANALYSIS

EGLIN AIR FORCE BASE

JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by RAB	Tested by RLF	Project No 89-31570
Checked by JRM	Date AUG 89	Plate 3

J 103 - 3/85



LIQUID LIMIT : ---
PLASTIC LIMIT : ---
FINE THAN # 200: 4%
CLASSIFICATION: (SP)

Sample Location: HA-4
3/4-5 ft. deep

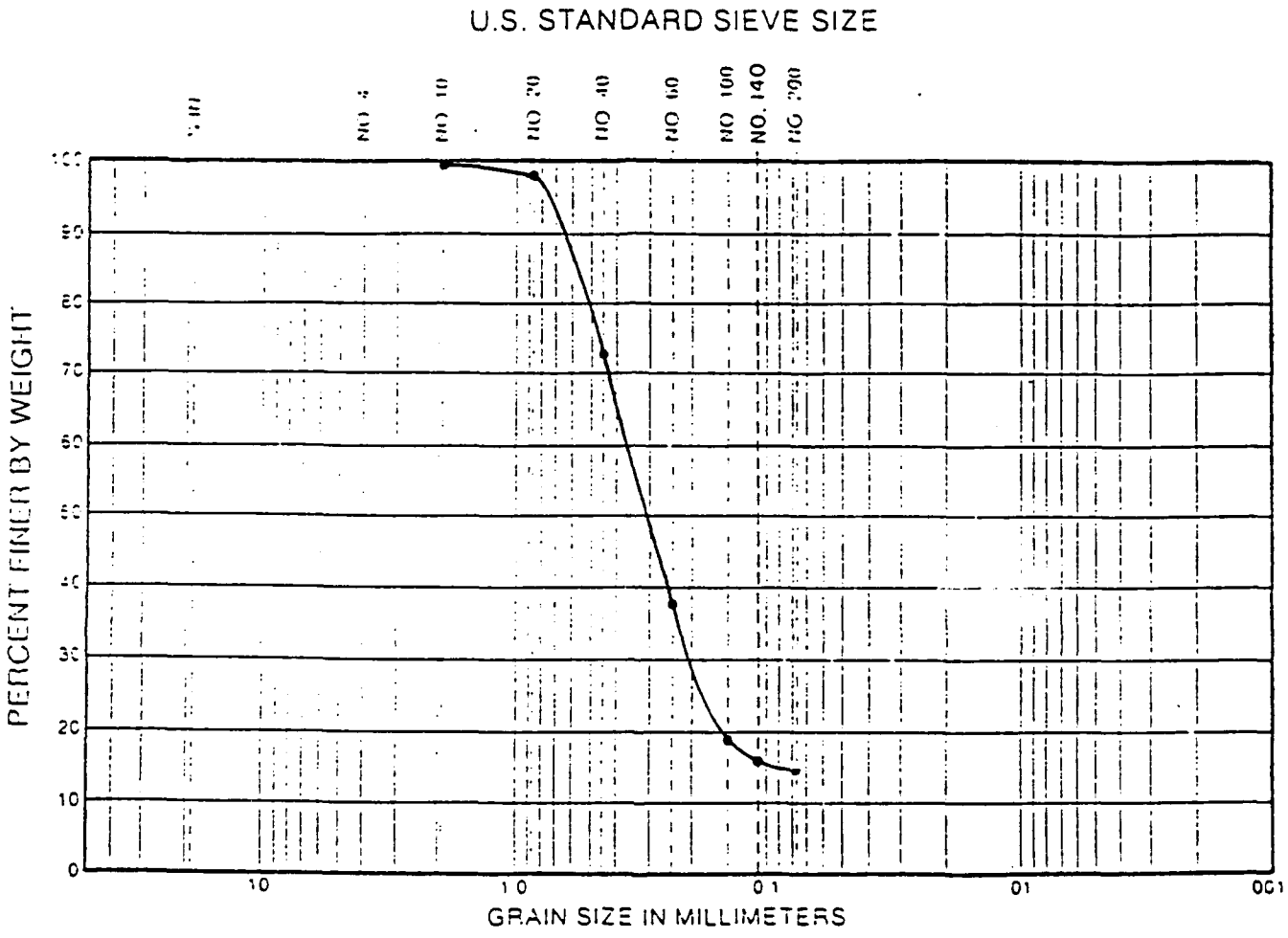
Sample Description: Yellow-orange fine sand

GRAIN SIZE ANALYSIS

EGLIN AIR FORCE BASE

JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by RAB	Tested by RLF	Project No 89-3157C
Checked by JRM	Date AUG 89	Plate 4



LIQUID LIMIT : ---
PLASTIC LIMIT : ---
FINE THAN # 200: 15%
CLASSIFICATION: (SM-SC)

Sample Location: HA-13

Sample Description: Reddish orange slightly clayey fine sand

GRAIN SIZE ANALYSIS

EGLIN AIR FORCE BASE

JAMMAL & ASSOCIATES, INC. Consulting Engineers

Drawn by RAB	Tested by RLF	Project No 89-31570
Checked by JRM	Date AUG 89	Plate 5

J 103 3/85

ENVIRONMENTAL CONDITIONS STUDY PROPOSED COMMISSARY ADDITION EGLIN AIR FORCE BASE, PENSACOLA, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

MEMBER
Associated Soil and Foundation Engineers, Inc.
American Consulting Engineers Council
National Society of Professional Engineers
Florida Institute of Consulting Engineers
American Society for Testing and Materials
American Concrete Institute

5925 Benjamin Center Drive, Suite 116, Tampa, Florida 33634 ■ Telephone (813) 886-1075

JAMMAL & ASSOCIATES, INC. Consulting Engineers

August 3, 1987
Project No. 89-31570-A

TO: A. S. Komatsu & Associates, Inc.
P.O. Box 2079
Fort Worth, TX 76113

Attention: Mr. Jim Clark

SUBJECT: Environmental Conditions Study
Proposed Commissary Addition
Eglin Air Force Base

Dear Mr. Clark:

In accordance with your request, we have completed the environmental conditions elements of our assignment at the proposed commissary addition at Eglin Air Force Base, Pensacola, Florida. The results of the geotechnical elements have been reported to you under separate cover. The following report documents our data collection and analytic efforts.

SITE OBSERVATIONS

The study area lies immediately east of the existing Commissary, located on Memorial Trail. This roadway is flanked by a drainage swale. Further southeast, thick vegetation, including young sand pines, is present. The topography becomes undulating to the southeast. An irregular low area, apparently presently functioning as a retention basin, intrudes into the planned building area, and occupies much of the planned parking lot. Part of this area contained standing water. The approximate configuration of the retention area as estimated from our field observations is shown on Sheet 1.

An existing landfill, designated as the D-2 landfill, is known to lie east and south of the subject site. Some information we were furnished indicates this landfill was expected 300 to 500 feet away, but an initial site reconnaissance on June 28, 1989, raised the suspicion that the landfill was much closer to the study area, perhaps occupying part of the planned development.

SUBSURFACE EXPLORATION

To explore the general subsurface conditions for the building expansion, five (5) Standard Penetration Test (SPT) borings were performed, as previously described. The boring locations were adjusted to miss the existing road, and were selected around the existing retention area that were accessible to our truck mounted drill rig.

In addition, twenty (20) hand auger borings were conducted throughout the proposed paved areas and proposed retention sites. The hand auger borings were performed by manually pushing and twisting a bucket auger into the ground in approximately 6 inch increments. The soils recovered were sampled, logged, and classified by our field geologist.

Several probes and shallow hand augers also were made within the existing retention area and the undulating area suspected to possibly contain landfill.

Our personnel positioned the field tests using tape measurement and estimated right angles from the existing building and other site features, based on dimensions scaled from the site plan furnished for our use. The approximate location of the borings is shown on Sheet 1.

SUBSURFACE CONDITIONS

Generalized Soil Conditions

The results of the subsurface exploration program including the stratification profile and some pertinent exploration information such as SPT "N" values and groundwater tables are graphically presented on Sheet 2. The stratification lines represent the approximate boundaries between soil types and the actual transition may be gradual. The soil strata were visually classified using the Unified Soil Classification System. Minor variations not considered important to our engineering evaluation may have been abbreviated or omitted for clarity.

Soil conditions at the site appear relatively uniform. According to the boring data, the site is generally covered with a thin surficial veneer of gray fine sand (Stratum 2), occassionally organic (Stratum 1). This is typically followed by orange-tan fine sand (Stratum 4). Occassional zones of brown fine sand (Stratum 6) and orange red silty fine sand (Stratum 3) also occurred at shallow depths. Below 2 to 6 feet, light tan to white fine sand (Stratum 5) was present. This soil continues to beyond 50 feet deep, based on the results of the deeper boring.

Some borings encountered buried debris (borings AB-9, AB-16, AB-18, and AB-20). In addition, several shallow probes and field observations were used to delineate expected areas of buried debris. The estimated limits of the buried debris are illustrated on Sheet 1. One boring within this area, AB-10, did not find debris. However, other evidence of landfilling was nearby. This information suggests that the landfilling was done in an irregular or trench fashion.

In conjunction with soil boring operations, organic vapor analysis of the boreholes was conducted in order to check for

the presence of combustible vapors (methane, hydrocarbons) in the shallow soils. The analyses were performed utilizing a Heath Consultants Porta-FID II flame ionization detector. In all borings tested the concentrations of combustible vapors were nominal ranging from 0-14 parts per million (ppm), well below the FDER designated standard of 500 ppm for excessively contaminated soil.

Groundwater Levels

The water table was found from about 2 to 7 feet below grade in the borings after a short stabilization period, and was apparently dependent upon the ground elevation at the boring locations, as would be expected. Fluctuations in the groundwater level are expected with rainfall patterns, post construction influences such as new retention area construction and low area filling, and other factors.

Monitor Well Siting

In order to assess groundwater quality conditions underlying the project site with respect to impact from historic landfilling, two (2) locations east of the project site were selected. At these locations 2" diameter PVC monitor wells were installed to a depth of 15 feet. These wells are configured as indicated on Plate 1 and are located as portrayed on Sheet 1.

Groundwater Sampling and Analysis

Groundwater samples were obtained from the wells on July 13, 1989, according to procedures and methodology detailed in Jammal & Associates, Inc. FDER approved Generic Quality Assurance Plan.

The samples were transported to PACE laboratories for analysis for:

* FAC 17-550 Primary Drinking Water Standard Metals
* FAC 17-550 Secondary Drinking Water Standards
* FAC 17-550 Primary Drinking Water Standard Pesticides and Herbicides

These parameters were selected to be generally indicative of groundwater contamination related to historic landfilling activities.

GROUNDWATER ANALYSIS RESULTS

The complete laboratory test reports are presented in the Appendix. Examination of this data indicates that several metallic compounds were identified at concentrations in excess of the Primary Drinking Water Standards, tabulated as follows:

PARAMETER	LOCATION	CONCENTRATION* REPORTED	MCL**
Chromium	MW-1	0.16	0.05
	MW-2	0.08	
Lead	MW-1	0.115	0.05
	MW-2	0.075	

* All values in parts per million (milligrams per liter)
** MCL = Maximum Contaminant Level

Additionally, iron, manganese, and other parameters in excess of Secondary Drinking Water Standards were detected at both monitor well locations. The metallics documented in these analyses are frequently related to landfilling of domestic wastes and are nominally in excess of regulatory standards. Since the facility is to be served by a potable water system, these concentrations are not thought to pose a threat to human health.

Jammal & Associates, Inc. appreciates the opportunity of providing professional services on this project. If you have any questions, please do not hesitate to call.

Sincerely,

JAMMAL & ASSOCIATES, INC.

Everett J. Ferris
Hydrogeologist

Stephen J. Haverl, P.G.
Geoenvironmental Services Manager

EJF/SJH/kms
0103h

pace laboratories, inc

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California
Leawood, Kansas

August 02, 1989

Mr. Jay Ferris
Jammal & Associates
5925 Benjamin Center Drive
Tampa, FL 33634

Dear Mr. Ferris:

Enclosed is the report of laboratory analyses for samples received 07/14/89.

If you have any questions concerning this report, please feel free to contact us.

Sincerely,

Steven G. Packard
Assistant Director, Analytical Services

Enclosures

pace laboratories, inc

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California
Leawood, Kansas

REPORT OF LABORATORY ANALYSIS

Jammal & Associates
5925 Benjamin Center Drive
Tampa, FL 33634

August 02, 1989
PACE Project Number: 290710520

Attn: Mr. Jay Ferris

31570

Date Sample(s) Collected: 07/13/89
Date Sample(s) Received: 07/14/89

PACE Sample Number: / Parameter	Units	MDL	565040 MW-1	565050 MW-2
INORGANIC ANALYSIS				
PRIMARY DRINKING WATER PARAMETERS				
Arsenic	ug/L	10	20	17
Barium	mg/L	0.3	ND	ND
Cadmium	mg/L	0.01	ND	ND
Chromium	mg/L	0.05	0.16	0.08
Lead	ug/L	5	115	75
Mercury	ug/L	0.2	0.7	0.7
Selenium	ug/L	10	ND	ND
Silver	mg/L	0.02	ND	ND
Nitrogen, Nitrate	mg/L	1	ND	ND
Sodium	mg/L	1	4	3
Fluoride, soluble	mg/L	0.05	ND	ND
SECONDARY DRINKING WATER PARAMETERS				
Chloride	mg/L	1	6	5
Color	Units	5	15	100
Copper	mg/L	0.05	0.08	0.06
Corrosivity	Units		-3.0	-3.6
Surfactants	mg/L	0.05	ND	ND
Iron	mg/L	0.3	55	60
Manganese	mg/L	0.05	0.38	0.38
Odor	Ton	1	ND	ND
pH	SU	-	5.9	5.7
Sulfate, as SO4	mg/L	5	6	6
Solids, Total Dissolved	mg/L	5	38	72
Zinc	mg/L	0.02	0.20	0.19
Turbidity	NTU	1	1400	1700

MDL Method Detection Limit
ND Not detected at or above the MDL.

pace laboratories, inc

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California
Leawood, Kansas

REPORT OF LABORATORY ANALYSIS

August 02, 1989
PACE Project Number: 290710520

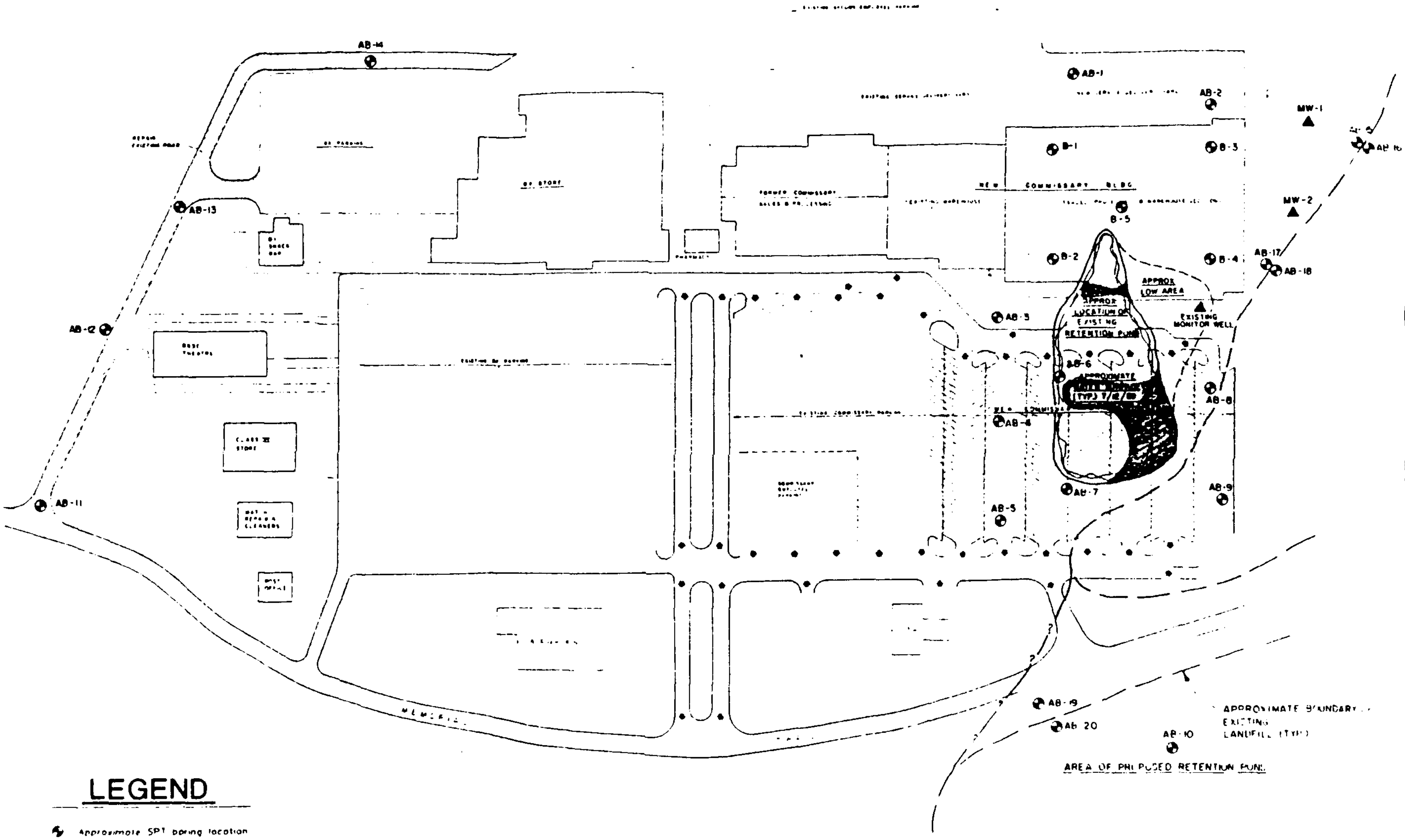
PACE Sample Number: / Parameter	Units	MDL	565040 MW-1	565050 MW-2
ORGANIC ANALYSIS				
SDWA ORGANICS (PESTICIDES/HERBICIDES)				
g-BHC	ug/L	0.05	ND	ND
Endrin	ug/L	0.05	ND	ND
Methoxychlor	ug/L	100	ND	ND
Toxaphene	ug/L	1.0	ND	ND
2,4-D	ug/L	1	ND	ND
Silvex	ug/L	1	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.

Steven G. Packard
Assistant Director, Analytical Services

Michael W. Palmer
Organic Chemistry Manager



LEGEND

- Approximate SPT boring location
- Approximate Hand Auger boring location
- ▲ Approximate Monitor Well location

BORING LOCATION PLAN

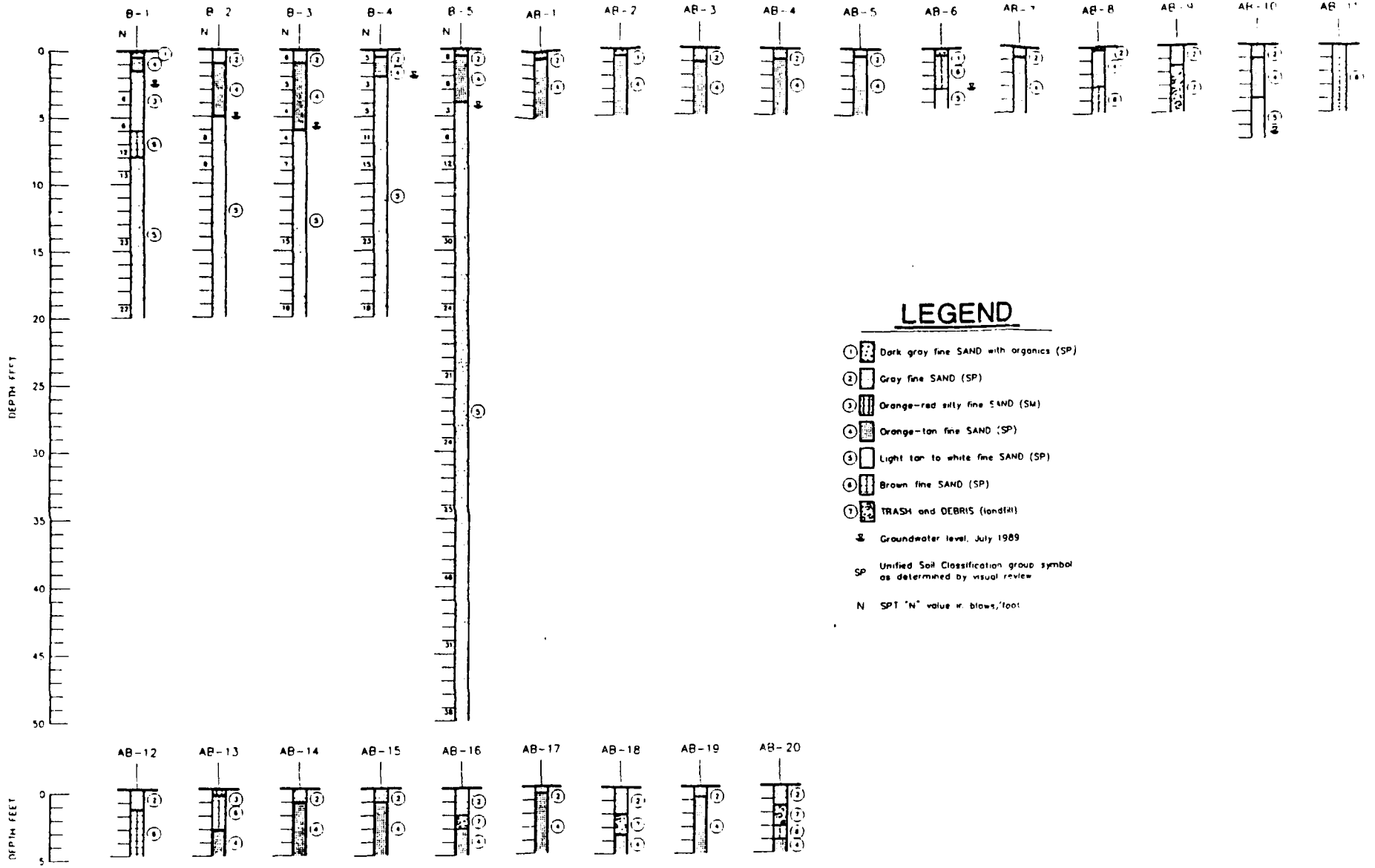
SCALE 1"=100

FIELD	RAC
DRAWN	RLF
CHKD	RAH
APPVD	JHM
	NOTED

DATE	BY	REVISION

GEOTECHNICAL STUDY
PROPOSED COMMISSARY ADDITION
EGLIN AIR FORCE BASE
PENSACOLA, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers



LEGEND

1. Dark gray fine SAND with organics (SP)
2. Gray fine SAND (SP)
3. Orange-red silty fine SAND (SM)
4. Orange-tan fine SAND (SP)
5. Light tan to white fine SAND (SP)
6. Brown fine SAND (SP)
7. TRASH and DEBRIS (landfill)

Groundwater level, July 1989

SP — Unified Soil Classification group symbol as determined by visual review

N — SPT "N" value in blows/foot

SOIL PROFILES

VERTICAL SCALE 1"=5'

FIELD	HAD
DRAWN	BLB
CHKD	RAB
APPVD	JRM

DATE	BY	REVISION

GEOTECHNICAL STUDY

PROPOSED COMMISSARY ADDITION
EGLIN AIR FORCE BASE
PENSACOLA FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

SECTION VIII - SUPPLEMENTAL GEOTECHNICAL STUDIES

JAMMAL & ASSOCIATES, INC. Consulting Engineers

November 21, 1989
Project No. 89-31570

TO: A.S. Komatsu & Associates
Post Office Box 2079
Fort Worth, Texas 76113

Attention: Jim Clark

SUBJECT: Supplemental Geotechnical Studies
Proposed Parking and Alternate
Retention Area Sites
Eglin AFB Commissary Addition

Dear Mr Clark:

As requested and authorized, we have completed a supplemental study of alternate retention area sites and the proposed parking area for the planned Eglin AFB Commissary addition. This letter describes our testing and the results obtained.

Test Pit Program

A series of test pits was excavated at the subject locations using an all wheel drive backhoe. A total of ten (10) pits were made to depths of five (5) to fifteen (15) feet. Test pits are useful in permitting a cross section of the shallow soils to be viewed, permitting better assessment of the nature and extent of debris than can be obtained with a small diameter borehole. The approximate location of the test pits, as estimated by tape measurement and approximate right angles from site features, are shown on Sheet 1. Sheet 1 also illustrates the location of the borings made in our initial study, and shows the proposed project layout.

The test pit results are presented as soil profiles on Sheet 1. These profiles were developed from notes and photographic records our geologist made in the field.

As described, the test pits in the north and southwest retention areas indicated natural soils. Test pits in the southeast area found substantial debris. Also, a strong petroleum odor was evident in the southeast area; the debris appeared automotive related. This location appears seriously polluted and should be brought to the attention of the base environmental department.

Test pits in the parking area revealed surficial rubble debris. However, the test pit program did not extend very far to the east due to the thick trees and limited time available. This area needs to be more completely explored, as it is likely the thickness of the debris and the likelihood of significant contamination increases to the east.

Permeability Tests

For this study two (2) methods of permeability testing were utilized; Shelby tube laboratory falling head permeability tests, and field falling head ("slug") tests in temporary shallow piezometers. The approximate test locations are indicated on Sheet 1.

For laboratory shelby tube permeability tests, a three-inch diameter, six-inch long thin-wall steel tube was pushed either horizontally or vertically into the soil stratum to be tested. A small test pit excavation was dug to access the soil. The tube was pushed by hand or by lightly tapping with a hammer. The tube sample was then excavated from the ground, capped, taped and returned carefully to the laboratory for testing. Once in the laboratory, the sample was inserted into a falling head permeability apparatus where the test was performed. During the test, the sample was saturated with several runs, then several tests were conducted on the sample to arrive at the appropriate average permeability value for the test.

A series of shallow falling head permeability tests were also performed. These tests were conducted by augering a shallow borehole, inserting a PVC standpipe with a porous tip, and then backfilling around the solid PVC portion with clayey soil. The piezometer was then filled with water, and the rate of drop recorded. Using formula developed by Hvorslev, the soil permeability was then calculated.

The permeability test results are included in tabular form on Sheet 2. As expected, relatively high values typical of clean fine sands were obtained. A value of thirty (30) feet per day is recommended for design.

Water Table-Retention Areas

Water tables in the northern location appear relatively shallow, similar to the existing low area. A design value of three (3) feet deep is recommended.

Water tables in the southwest retention area were deeper; a design value of nine (9) feet below grade is recommended.

As we do not have access to elevation data, these recommendations should be correlated carefully with past readings, water level elevations in the existing low area, etc. If there are any apparent discrepancies, please contact us for clarification.

Parking Area Debris Removal

We were asked to develop estimates for debris removal and replacement from the parking area and retention area. As previously mentioned, the south retention area site appears excessively contaminated with petroleum products, and thus is not suitable for use as a retention area. Thus, we will address the parking area only.

In order to develop this estimate, we have assumed removal of the debris laden fill to a Class I sanitary landfill, and its replacement with compacted sand fall to original grades. We have assumed no excessively hazardous materials that would preclude this option. As discussed previously, the parking area deserves further study to confirm this if it is decided to pursue this route. Further, additional data on the type, extent and nature of the debris is needed.

Our estimated cost for this work is $275,000.00 to $300,000.00.

We have previously furnished, in our original geotechnical report, recommendations for site preparation if the debris is left in place under the parking area. As described therein, this option is feasible, but may require future reconstruction of some parking areas as they settle.

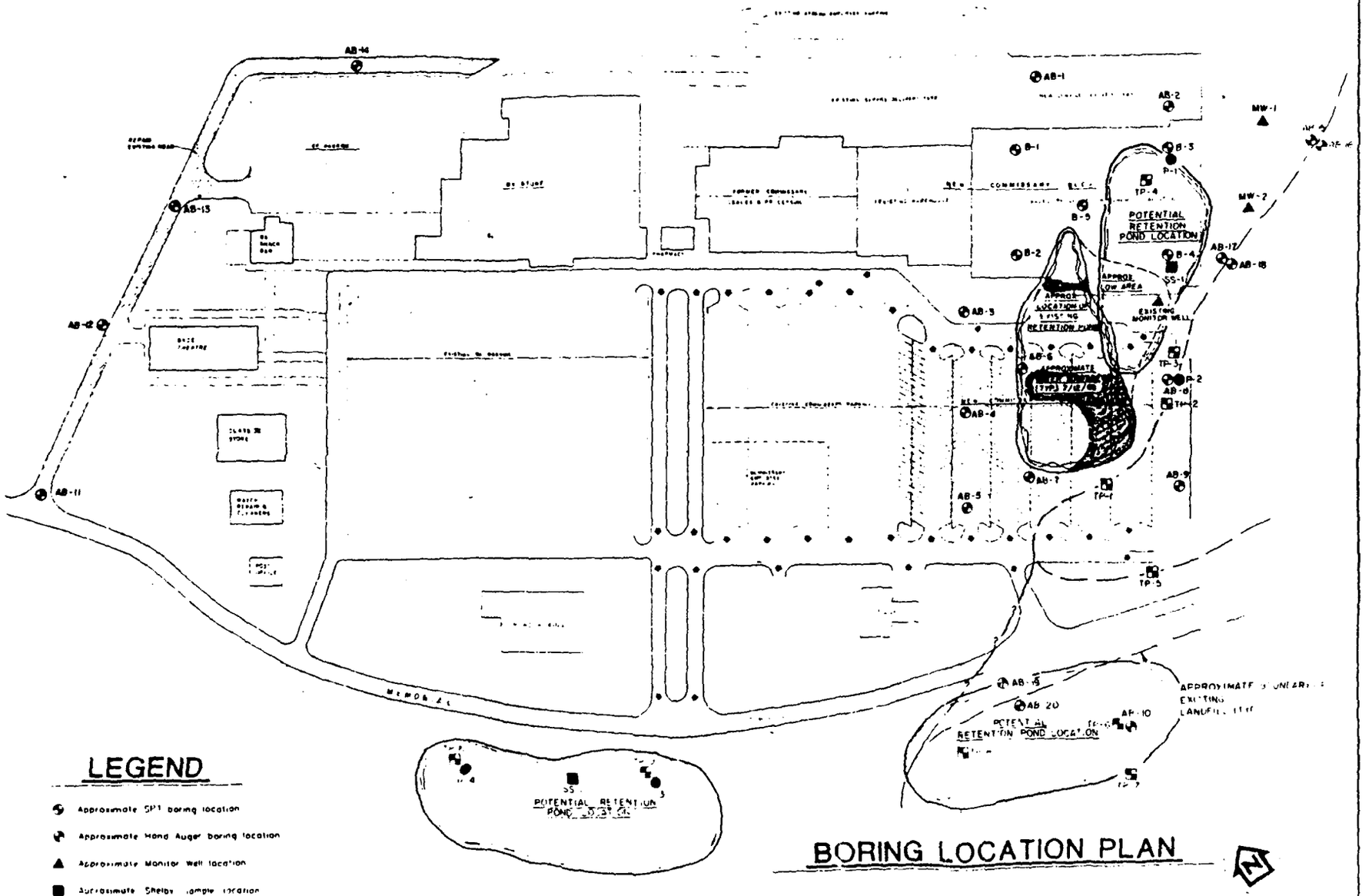
We appreciate the opportunity to be of service on this project. Please call with any questions.

Sincerely,

JAMMAL & ASSOCIATES, INC.

John R. Marquardt, P.E.
Tampa Regional Manager

JRM/bjc:3197J



LEGEND

- Approximate SPT boring location
- Approximate Hand Auger boring location
- Approximate Monitor well location
- Approximate Shelby sample location
- Approximate test location
- Approximate Permeability Test location

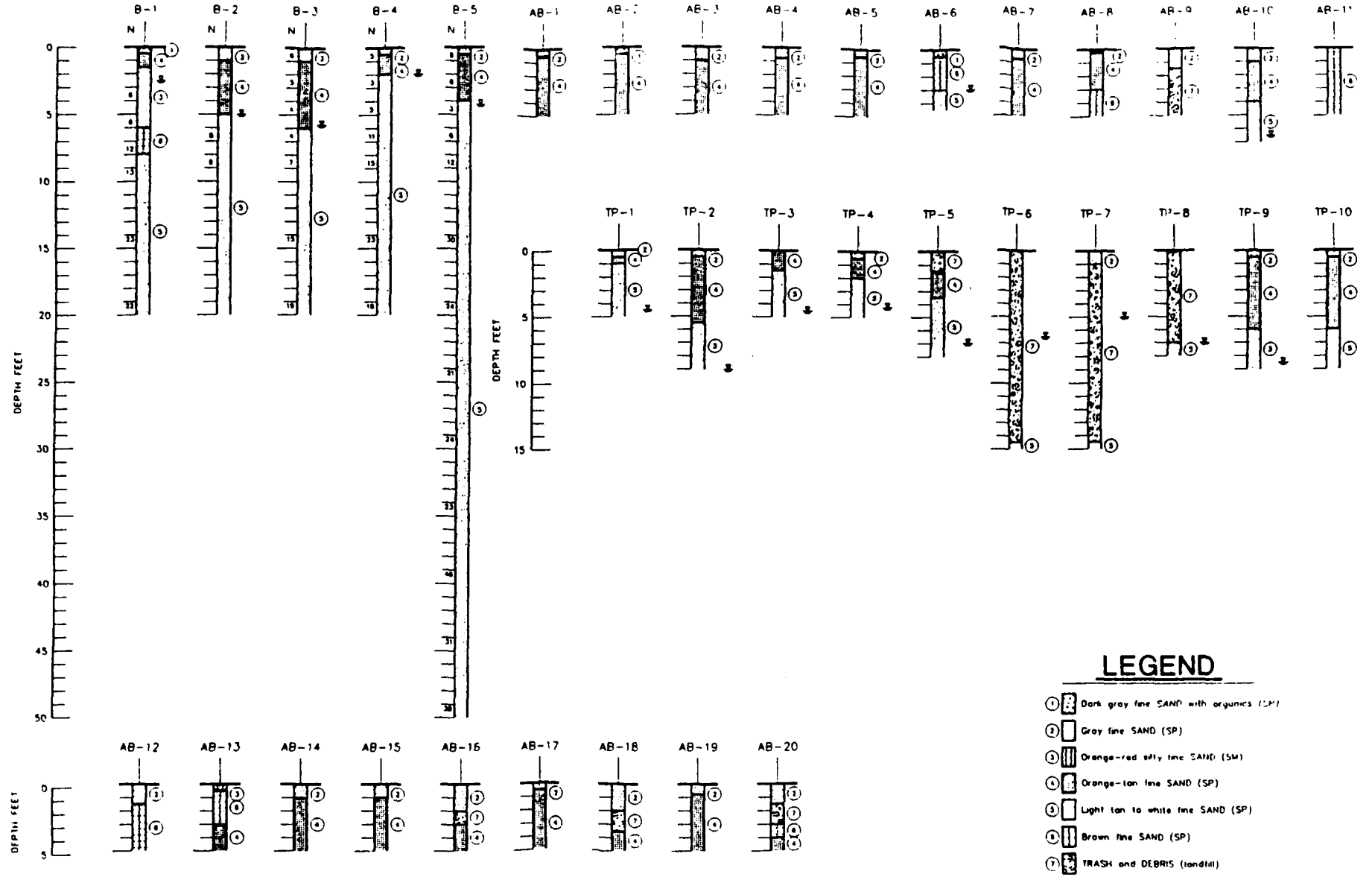
BORING LOCATION PLAN

FIELD	RAL
DRAWN	RAL
CHKD	MAA
APPVD	JMM

DATE	BY	Revision
	JMM	Added P-1 through P-4
		Added TP-1 through TP-7
		Added SS-1 through SS-3

GEOTECHNICAL STUDY
PROPOSED COMMISSARY ADDITION
EGLIN AIR FORCE BASE
FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers



LEGEND

1. Dark gray fine SAND with organics (SP)
2. Gray fine SAND (SP)
3. Orange-red silty fine SAND (SM)
4. Orange-tan fine SAND (SP)
5. Light tan to white fine SAND (SP)
6. Brown fine SAND (SP)
7. TRASH and DEBRIS (landfill)

Groundwater level July 1989

SP Unified Soil Classification group symbol as determined by visual review

N SPT "N" value in blows/foot

k_v Coefficient of Vertical Permeability (Ft./day)

k_h Coefficient of Horizontal Permeability (Ft./day)

SOIL PROFILES

VERTICAL SCALE 1"=5'

LABORATORY PERMEABILITY TEST RESULTS

LOCATION	DEPTH (ft.)	PERMEABILITY
SS-1	2.0	k_v=39.3
SS-1	2.0	k_h=42.7
SS-2	2.0	k_v=40.4
SS-2	2.0	k_h=24.0
P-1	4.75	k_v=30.0
P-2	4.75	k_h=24.0
P-3	4.75	k_v=38.0
P-4	4.75	k_h=28.0

FIELD	RAC
DRAWN	BLB
CHKD	RAB
APP'D	JRM
	NOTES

DATE	BY	REVISION
11/89	JRM	Added TP-1 through TP-10

GEOTECHNICAL STUDY

PROPOSED COMMISSARY ADDITION
EGLIN AIR FORCE BASE

PENSACOLA, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

DATE | PROJ. NO. 89-157. | SHEET 2 OF —

SECTION IX - ENGINEERING STUDY
(CARTER & BURGESS, INC.)

ENGINEERING STUDY
FOR ALTERNATIVES AT
EGLIN AIR FORCE BASE, FLORIDA

PREPARED BY:

CARTER & BURGESS, INC.
ENGINEERS-PLANNERS-SURVEYORS
1100 MACON STREET
FORT WORTH, TEXAS 76102

C&B NO. 89007462F

ENGINEERING STUDY
FOR ALTERNATIVES AT
EGLIN AIR FORCE BASE, FLORIDA

SCOPE:

On alternatives selected and designed by Komatsu, Carter & Burgess is to quantify the relative difference between each alternative as it relates to the cost difference in parking lots, utilities, retention ponds, and concerns for eventual development.

LIMITATIONS:

This report uses the 30 percent submittal as the base plan that all others are compared against. This 30 percent base plan was prior to knowledge that the landfill did occupy the location of the proposed retention pond. Therefore, all costs will be relative to the basic scope project as defined by AFCOM.

All information is based on existing information as it exists in the hands of the engineer. The major concerns and points noted that must be verified in order for each alternative to be a workable solution is noted at the end of the discussion for each alternative.

ENGINEERING STUDY
FOR ALTERNATIVES AT
EGLIN AIR FORCE BASE, FLORIDA

30% BASE PLAN

A. COST DIFFERENCE:

This is the base plan on which all other alternatives are compared to. Therefore, no cost difference exists.

B. PARKING LOT:

The base plan leaves approximately 390 existing parking spaces and constructs 350 additional parking spaces, portions of which are now known to be over the existing landfill. This would leave a net of 132 parking spaces for employees and 608 parking spaces for customers.

C. UTILITIES:

On the base plan, relocation of utilities were mainly in the water line being relocated to the east of the new commissary and new storm drainage lines being developed to the south to enter the new retention pond.

D. POND:

It was anticipated that a new retention pond could be developed to the south of Memorial Trail. However, geotechnical investigation indicates that this area is in the existing landfill area. For this alternative to work, the landfill area under the parking lot and down to the proposed retention pond would have to be removed and abated. This cost is not included or shown on the base line cost estimate.

E. REQUIRED VERIFICATION:

Verification was made and does show this alternative is not a viable one unless the landfill is abated from this area.

F. MAJOR CONCERNS:

If existing landfill was abated, there is always a possibility of uncovering materials that will require hazardous removal which would up the cost by magnitudes. To date, all indications are that the landfill does not contain any hazardous material.

ENGINEERING STUDY
FOR ALTERNATIVES AT
EGLIN AIR FORCE BASE, FLORIDA

ALTERNATE 1

A. COST DIFFERENCE:

The alternative as shown in exhibits has an approximate cost differential of $96,000. (Cost of removing landfill not included)

B. PARKING LOT:

The parking lot configuration is the same as the 30 percent submittal with a portion of the parking lot constructed over the existing landfill. Additional costs not shown would be encountered due to either (1) removal when filling the landfill area under the parking lot or (2) stiffening the section of the pavement to bridge the landfill area. In either case, it is the engineer's belief that higher maintenance cost will be required to constantly patch cracking pavement over the life of this project.

C. UTILITIES:

Utilities are essentially the same as in the 30 percent concept except for the storm drainage. Additional lengths will be required to reach the relocated retention pond since these lines must be located outside of existing landfill area.

D. POND:

Two retention ponds are required: (1) A one acre ± (1.5 acre feet) south of Memorial Drive, and (2) One to four acres (7-8 acre feet) northeast of the new commissary. The northern pond is required to retain the overflow which has been dammed by the new commissary location (see Exhibit 1). Available groundwater data indicates that pond (2) will have to be relatively large and shallow due to a shallow groundwater table. The pond (1) site is marginal for use a a dry pond, again because of a relatively shallow groundwater table. The pond (1) site can be used as a wet detention pond; however, the permitting and regulatory requirements are much more stringent for wet ponds, including requirements for specially vegetated littoral zones which must be maintained as a condition of the permit.

E. REQUIRED VERIFICATION:

1. Pond (1) must not be in a landfill area.

2. Pond (2) must not be in a landfill area.

3. Existing grades along proposed storm drain route to pond (1).

F. MAJOR CONCERNS:

No overland (positive) overflow from the northern pond is available except through the commissary. Overflow channels cannot be constructed through the landfill area unless the landfill is abated at additional cost. Thus, all runoff into this pond from the north must infiltrate into the soil. Detailed infiltration studies will be required to insure that the pond volume will be available for capturing runoff from successive storm events.

ENGINEERING STUDY
FOR ALTERNATIVES AT
EGLIN AIR FORCE BASE, FLORIDA

ALTERNATE 2

A. **COST DIFFERENCE:**

The relative cost difference of Alternate 2 to the base plan is approximately $32,000.

B. **PARKING LOT:**

The existing spaces retained are the same as in the base plan. However, the new parking lot has been reduced by approximately 150 spaces to 260 spaces. The area reduced is that which was on top of the landfill. A new employee parking lot is constructed north of the commissary. This parking lot will hold approximately 60 cars.

C. **UTILITIES:**

Utilities are roughly the same as in Alternate 1 in the base plan with minor reduction in storm drainage lines due to less parking lot area.

D. **POND:**

The ponds are identical to those in Alternate 1.

E. **REQUIRED VERIFICATION:**

The same verifications are required as in Alternate 1.

F. **MAJOR CONCERNS:**

The same concerns exist in Alternate 2 as those in Alternate 1. The northern retention pond does not have a positive overflow.

ENGINEERING STUDY
FOR ALTERNATIVES AT
EGLIN AIR FORCE BASE, FLORIDA

ALTERNATE 3

A. **COST DIFFERENTIAL:**

Approximate cost difference is $337,000.

B. **PARKING LOT:**

This alternate demolishes 234 existing parking spaces. In the area remaining as shown on the definitive is an employees parking area of approximately 132 spaces. Alternate 3 will provide for a total of 656 parking spaces, of which 180 are employee or remote parking. A net customer parking gain will be 146 spaces. The net consumer parking spaces compared to the base plan will be a -22 percent.

C. **UTILITIES:**

Additional water main relocation will be required, but much less sanitary sewer relocation will be required. The storm drainage system itself will be rather extensive because of relocation of the existing lines to go around the new commissary and into the new pond.

D. **POND:**

The existing pond will be filled in and a new pond will be developed to the north and west of the old one.

E. **REQUIRED VERIFICATION:**

1. Additional pond area needs to be verified that it is not in the landfill.

F. MAJOR CONCERNS:

The new parking lots to the north will be developed in heavily wooded areas, as well as major excavation will be required. It is unknown at this time what the water levels in this area are and what the disposition of the excess materials can be used for. The amount of usable parking spaces will be derived from an additional $270,000 in paving costs and is not the most economical alternative. The pond bottom and storm drain outfall elevations may have to be located below the normal seasonal high groundwater elevations, potentially triggering the need to permit the facility under the more restrictive criteria applicable to wetlands storm water facilities. Depending on the exact limits of the proposed new construction and the landfill, sufficient area may not be available for a wetlands pond with its littoral zone requirements.

ENGINEERING STUDY
FOR ALTERNATIVES AT
EGLIN AIR FORCE BASE, FLORIDA

ALTERNATE 4

A. **COST DIFFERENCE:**

This alternate would be approximately $58,000 less than the base plan.

B. **PARKING LOT:**

Sixty existing employee parking spaces will be demolished under this alternative. 292 new spaces will be provided, of which 160 will be for employees, leaving a net of 132 spaces for customers. This would leave a net of 24 percent less customer parking spaces than the base plan.

C. **UTILITIES:**

Fewer relocations of water lines, sanitary, and storm drainage will be required. A new storm drainage system will be required for the new parking lots to the north and the east.

D. **POND:**

The existing pond will be modified and enlarged for this alternative. Additional channels proposed around the new parking lot will have to be constructed.

E. **REQUIRED VERIFICATION:**

Existing groundwaters in the northwest corner of the parking lots.

F. **SPECIAL CONCERNS:**

Major excavation will be required to the new parking lot on the north, but this will be less than that required from Alternate 3.

Same pond concerns as Alternate 3.

ENGINEERING STUDY
FOR ALTERNATIVES AT
EGLIN AIR FORCE BASE, FLORIDA

ALTERNATE 5

A. **COST DIFFERENCE:**

This is the most expensive alternate as compared to the base plan and is $331,000 additional cost as compared to base plan.

B. **PARKING LOT:**

Sixty existing employee parking spaces will be demolished under this alternative. 460 new spaces with a net of 340 for customers and 120 for employees will be developed. Overall, this will provide 10 percent more parking for customers than the base plan, but nine percent fewer parking spaces for employees.

C. **UTILITIES:**

Fewer relocations of water, sewer, and storm drainage will be required. However, new storm drainage lines will be extensive.

D. **POND:**

As with Alternate 4, existing pond will be reused and enlarged to fulfill the requirements for the new construction. Channel flows will be relocated as required.

E. **REQUIRED VERIFICATION:**

Groundwater elevations for excavated areas.

F. **MAJOR CONCERNS:**

Extensive excavation will be required for this alternative, as well as rerouting existing channels on the northern side for storm drainage water around the new parking areas. Whether or not sufficient elevations will be available for these relocations are yet to be determined.

Same pond concerns as Alternate 3.

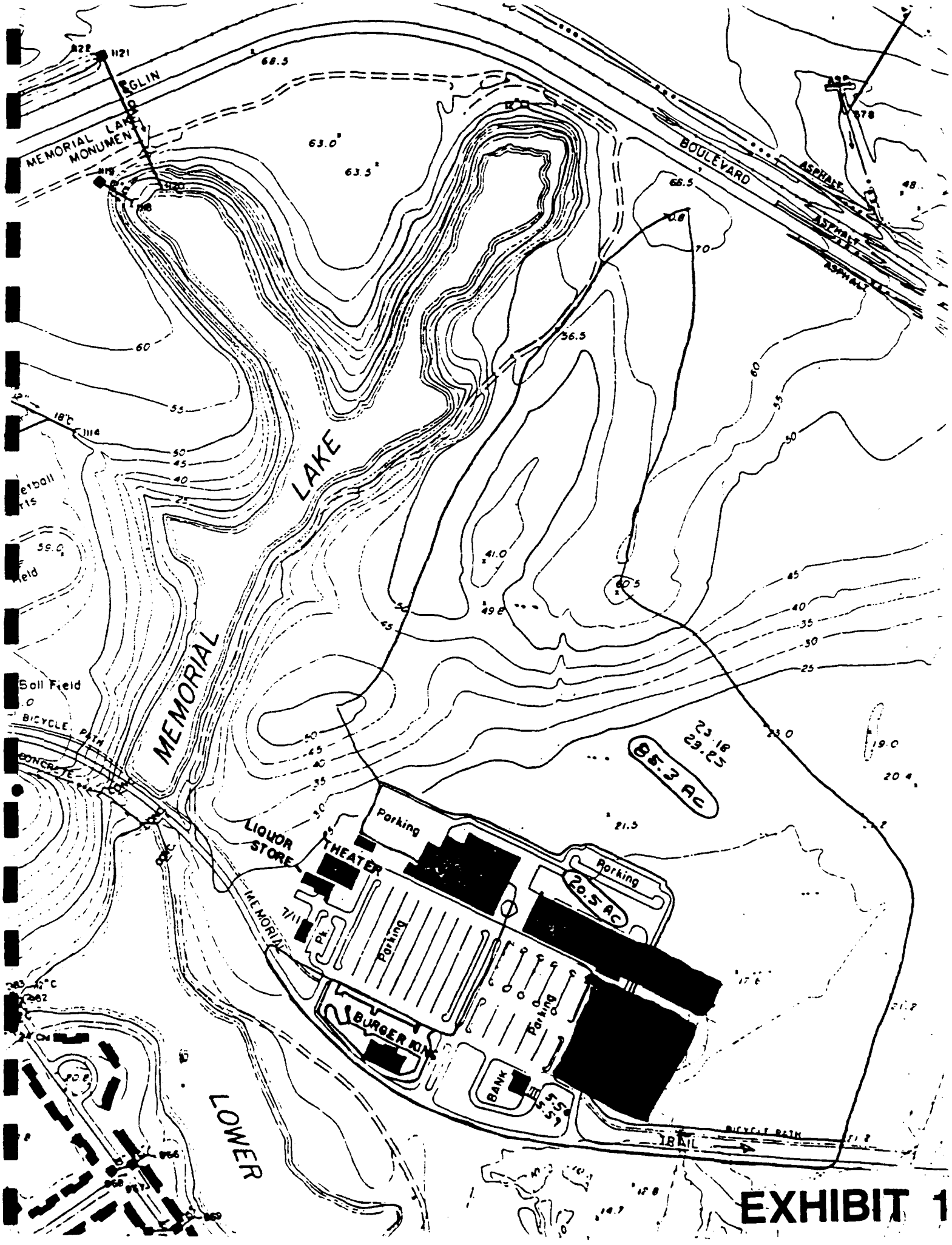

MEMORIAL LAKE MONUMENT
BOULEVARD
ASPHALT
LAKE
MEMORIAL
LOWER
Soll Field
BICYCLE PATH
CONCRETE
LIQUOR STORE
THEATER
Parking
Parking
Parking
Parking
20.5 AC
85.3 AC
7/11
BURGER KING
BANK
TRAIL
BICYCLE PATH

EXHIBIT 1

EGLIN AIRFORCE BASE

DESCRIPTION	93% PLAN	ALTERNATE 1	%CHGE	ALTERNATE 2	%CHGE	ALTERNATE 3	%CHGE	ALTERNATE 4	%CHGE	ALTERNATE 5	%CHGE
EXIST. SPACES	350	350	0.0%	350	0.0%	156	-60.0%	330	-15.4%	330	-15.4%
NEW SPACES CONS	350	350	0.0%	260	-25.7%	500	42.9%	292	-16.6%	460	31.4%
TOTAL	740	740	0.0%	650	-12.2%	656	-11.4%	622	-15.9%	790	6.8%
NET EMPLOYEE	132	132	0.0%	120	-9.1%	180	36.4%	160	21.2%	120	-9.1%
NET CUSTOMER	606	606	0.0%	530	-12.8%	476	-21.7%	462	-24.0%	670	10.2%
		COST TO PRIME									
DEMOLITION	10,171	**********	-3.6%	**********	-3.6%	**********	298.2%	*********	141.4%	**********	199.5%
EARTHWORK	90,981	**********	26.7%	**********	26.7%	**********	39.7%	*********	-62.7%	**********	36.9%
SITE IMPROVE	45,176	**********	199.1%	**********	141.4%	**********	104.5%	*********	-1.0%	**********	111.0%
UTILITIES	51,291	**********	20.3%	**********	20.3%	**********	-24.8%	*********	-52.5%	**********	-27.8%
PAVING	825,642	**********	0.0%	**********	-8.0%	**********	28.6%	*********	1.4%	**********	29.8%
TOTAL	1,022,061	**********	9.4%	**********	9.1%	**********	92.7%	*********	-5.6%	**********	92.2%

SECTION X - ASBESTOS STUDY (ACCI)

ACC INC

ASBESTOS CONTROL CONSULTANTS INC.

INSPECTION REPORT

FOR

EGLIN AIR FORCE BASE COMMISSARY

HOUSTON BLDG. SUITE 210 9171 CAPITAL OF TEXAS HIGHWAY, NORTH AUSTIN, TEXAS 78759 (512) 343-5070

ACCinc
ASBESTOS CONTROL CONSULTANTS INC.

August 9, 1989

Mr. Tommy Stewart
Komatsu & Associates, Inc.
550 Bailey, Ste. 715
Fort Worth, Texas 76107

RE: Inspection of Eglin AFB Commissary
Project #95

Dear Mr. Stewart:

ACCinc has completed the inspection for Asbestos Containing Materials (ACM) in the Eglin AFB Commissary building in Niceville, Florida. The building was inspected from dates 7/10/89 to 7/18/89 by Troy Lowry and Paul Pousson.

As per the inspection, the commissary appears to have been constructed in two different phases.

Phase I/General Sales Area (GSA) containing approximately 33,000 square feet of floor space, was built in 1971. It is a single story steel frame structure with I-beams and bar joists and pitched metal roof with a sprayed-on, fibered asphaltic coating. The floor structure is concrete with both a vinyl tile and terrazzo tile finish. The exterior walls are metal and interior walls are a combination of metal, drywall and concrete block.

ACM was found in the following applications of this construction phase:

- Vapor barrier paste
- Floor Tile
- Floor Tile Mastic
- Flange Gaskets/Boiler
- Metalbestos Flue
- Roof flashing

Vapor Barrier Paste

Vapor barrier paste has been used as a sealant on all seams and butt joints of the HWS-R, CWS-R and Potable water lines. This paste was also found on the refrigeration pipe in the frozen food, dairy, produce and meat storage areas. In general the material is intact and in sound condition. There is approximately 2,950 linear feet of thermal ACM in this construction phase. (Note: none of the refrigeration pipe insulation in the dairy addition, frozen food addition or meat addition of the GSA contains asbestos). The pipes in the refrigeration trenches are copper and most are non-insulated (a few are insulated with Armaflex foam rubber).

Floor Tile

Both the orange and blue vinyl tile in the GSA contain asbestos. If remodeling, demolition, etc. is to occur, all tile and mastic must be removed as ACM material. These tile are in moderate condition with a high potential for damage in areas of heavy traffic and where condensation occurs due to the non-insulated pipes beneath the floor. There is approximately 33,000 square feet of asbestos containing floor tile.

Floor Tile Mastic

Laboratory analysis indicates that asbestos is present in the floor tile mastic of the orange and white tile. It must assumed that all mastic contains asbestos. There is approximately 33,000 square feet of asbestos containing floor tile mastic.

Flange Gaskets

There are two (2) asbestos containing flange gaskets on the boiler in mechanical room #2.

Metalbestos Flue

There is a 12" metalbestos flue on the center gas hot water heater in mechanical room #2. It is in good condition with little potential for damage.

Roof Flashing

The roof flashing material used on the meat, dairy and frozen food additions contains asbestos.

Phase II/Warehouse Area containing approximately 28,560 square feet of floor space, built in 1979. It is a single story, precast concrete structure with a built-up roof membrane and drywall and concrete block interior walls. The floor structure is concrete with vinyl tile in the restrooms, breakroom and computer scanning office and carpet in the commissary and cash offices. There is a suspended ceiling in all of the offices, restrooms, breakroom and adjacent hallways, (excluding the warehouse managers office).

ACM was found in the following applications of this construction phase:

- Vapor barrier paste
- Roof flashing, gauze and felts

Vapor Barrier Paste

Vapor barrier paste has been used as a sealant on all seams and butt joints of the HWS-R and CWS-R water lines. There is approximately 2,854 linear feet of thermal ACM in this portion of the commissary.

Roof Flashing

The roof flashing, gauze and felts of all areas of the warehouse roof including all downspouts contains asbestos.

Note: the entire building contains a non-insulated sprinkler system.

Attached please find the following:

- a description and location of where each sample was taken
- the results of the laboratory analysis of each sample

If there any details I can clarify or information I can provide, please call me.

Sincerely,

ASBESTOS CONTROL CONSULTANTS, INC.

Paul Pousson
Field Operations
Enclosure

ASBESTOS CONTAINING MATERIALS SURVEY

Building Owner: Eglin Air Force Base

City:

Building: Commissary - General Sales Area and Warehouse

Inspection Results

Sample #	Type	Location/Description	Asbestos?
01	T	Pipe Insulation - above Women's RR - North End - GSA	YES
02	T	Pipe Insulation - above Women's RR - North End	ND
03	T	Pipe Insulation Mud - above Men's RR - North End	YES
04	T	Pipe Insulation Mud - H/W Return/AC Mech. Rm. #1	YES
05	T	Pipe Insulation - City Water - Mech. Rm. #1	TRACE
06	T	Pipe Insulation - above Veterinary Office	ND
07	M	Red Floor Tile - Produce Office	ND
08	M	White Floor Tile - Meat Wrapping Entry	ND
09	M	Gold Floor Tile - Main Entry	ND
10	M	Green Floor Tile - Main Entry	ND
11	T	Pipe Insulation Paste - Frozen Food Storage	YES
12	M	Orange Floor Tile - Vestibule Exit	ND
13	M	Roof Flashing - GSA - Meat Additions	YES
14	M	Roof Felt - Downspout/SE Corner - Warehouse	YES
15	M	Roof Felt - Downspout SE/Corner - Warehouse	YES
16	M	Roof Flashing - SE Corner - Warehouse (asphalt shingles)	ND
17	M	Roof Gauze - Joint of GSA/Warehouse	YES

18	M	Brown Floor Tile - Computer Scanning Office	ND
19	M	Base Floor Material - Computer Scanning	ND
20	M	Drywall Mud - Receiving & Backup Office	ND
21	M	Orange Floor Tile - Meat Wrapping Entry	TRACE
22	M	Orange Tile Mastic - Meat Wrapping Entry	YES
23	M	White Tile Mastic - Meat Wrapping Entry	YES
24	M	Blue Floor Tile - Refrig. Trench Cover	TRACE

Key to Abbreviations

ND = None detected
A/H = Air handler
HW = Hot water
TRACE = Less than 1 %

Sample Type:

S = Surface Material
T = Thermal Insulation
M = Miscellaneous

ATTACHMENT "A"

Only major components of construction and insulation are inspected and sampled.

Survey or review for ACM is limited to those suspect materials normally visible or specifically pointed out. Suspect materials are those building materials generally known to have contained asbestos. Identification of suspect materials is based upon the consultant's experience, knowledge and assessment of the building type and period of construction.

Surfacing Materials include fireproofing and acoustic application. Surfacing materials are potentially the most hazardous.

Thermal Insulation includes boiler, pipe and duct insulation. This material is normally found on gas or oil fired boilers, hot water lines, condensate return lines, and duct work. Usually, this material is of greatest risk to the maintenance workers.

Miscellaneous Materials include floor tile, ceiling tile, cooling towers, and soffits. Often this material is non friable and only creates exposure if greatly abused through abrasion or cutting during demolition or removal.

Consultant shall rely upon the accuracy of client provided information, drawings, reports and data in order to survey, review and report conditions. The consultant recommends that the client notify and schedule access with occupants and further, have an individual provide access for the consultant who is knowledgeable with all spaces.

Suspect material buried, located in chases, plenums, walls, ceilings, or discreet or hidden areas or otherwise not pointed out or provided access to shall be considered as concealed and therefore not subject to review.

Access to suspect material is defined as the right to enter without interference from occupants, locks or other barriers. Access may be scheduled by the client without compromise of consultant's efficiency and time.

Vinyl Tile Products (VAT) Analytical Requirements

Based on cost, the analysis procedure of choice for the determination of asbestos in a bulk sample is polarized light microscopy augmented with dispersion staining (PLM/DS). In this procedure individual fibers are identified under relatively low magnification by the diffraction of light passing through the fiber. Small fibers (called fines) will be difficult to identify due to low magnification and the small amount of light going through the fiber. Fibers that are coated and unable to be cleaned, do not allow the light to pass through; again, smaller fibers are harder to get clean.

The vinyl industry used asbestos fibers to add strength and flexibility to their products. Asbestos fines mixed better with their product and were cheaper to buy. Most, if not all, vinyl products - in particular vinyl floor tile - that were made through the middle 1970's have asbestos in them but most likely would not test positive using PLM/DS. Therefore, all samples testing negative using PLM/DS should be assumed positive. Testing to disprove the presence of asbestos must be accomplished by other methods - the Scanning Electron Microscopy (SEM) method is recommended.

Sampling the following products may lead to severe damage and/or a health hazard. Therefore, field observation is used:

Vibration gaskets which are located in the duct work between the fans of an AHU and the main duct runs were previously required by building codes to be ACM.

Transit panels are easily identified in the field. If they have an attached metal border or other trim, they are very difficult to sample without causing severe damage to the panel.

Transite flues are easily identified in the field. Being brittle, the collection of a sample may severely damage the flue. A broken flue may release poisonous gases into the building.

For example, if the major component of a thermal system is fiberglass and all observed EJTVs are non-asbestos , each individual joint is not inspected. There is a possibility that some individual EJTV has ACM, which would not be detected. Conversely, if any EJTV tested positive, all EJTVs would be considered positive, although many not be ACM.

Major fire/smoke stop materials sealing pipe penetrations should be sampled if friable or extensive, however, it would be impossible to sample each sealant. Similar conditions exist with all minor patching materials throughout the building.

APPENDIX II

Assignment of Old Commissary Space

Letters:

- Army & Air Force Exchange Service 14 December 1990
- Directorate of Civil Engineering 6 December 1990

AAFES

Army & Air Force Exchange Service
Eglin Air Force Base Exchange
Eglin Air Force Base, Florida 32542-7428

SVE

DEC 14 1990

SUBJECT: Assignment of Old Commissary Space

3201 SVS/CC (Col Kase) Concur Kase 12/14
3200 SPTW/CC (Col Marshall) Concur 12/24 on
3202D AD/DE (Mr Clark)
IN TURN

1. Reference letter of 6 December 1990 (Assignment of Space), from DEE.

2. On 14 December 1990, I spoke to the AAFES-HQ Chief Architect regarding the relocation of buildings 977 and 978 to the Mall Project, #0944-89-014. The outcome is as follows:

a. If the old Commissary is used as part of the project, there will not be sufficient retail space to accomodate the transfer of buildings 977 and 978.

b. If the mall is expanded to the rear and left side, the old Commissary will not be utilized and buildings 977 and 978 can be incorporated into the old Commissary building.

3. Building 978 is an Area Maintenance Building utilized as a central location for 8 to 10 skilled maintenance personnel who travel and do general maintenance work throughout the southern portion of the United States, Panama and Puerto Rico. This office is not part of the Eglin Exchange system.

4. The demolition of buildings 977 and 978 cannot be included as part of the scope of project #0944-89-014 nor can it be funded for demolition from non-appropriated funds.

JAVIER E. CERNA
Exchange Manager

cf: GM-FLAX

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 3200TH SUPPORT WING (AFSC)
EGLIN AIR FORCE BASE, FLORIDA 32542-5000

REPLY TO ATTN OF: DEE

6 DEC 1990

SUBJECT: Assignment of Space

TO: 3201 SVS/SVE

1. On 3 Dec 90 the Space Utilization Committee approved your use of Building 1755 after completion of the commissary addition in Jun 92. The space is to be used as Exchange maintenance, warehouse, and a mall complex.

2. It is understood by relocating your maintenance and warehouse functions, Buildings 977 and 978 will be vacant. Accordingly, request the demolition of these buildings be included in the project scope for renovating Building 1755.

Lawrence G. Kozella

LAWRENCE G. KOZELLA, P.E.
Chief, Engrg & Contract Planning Div
Directorate of Civil Engineering

cc: 3201 SVS/CC

APPENDIX III

Jurisdiction Over Wetlands

U.S. Army Corps of Engineers
Letter dated 2 July 1990

FACSIMILE TRANSMITTAL HEADER SHEET					
COMMAND	NAME OFFICE SYMBOL	TELEPHONE NUMBER	AUTHORIZED RELEASER'S SIGNATURE		
FROM: D Hambrick	COE Reservation	763-0717	Stacy Lambert		
TO: J. Barthwick	U.S. Air Force		DATE-TIME 9:30 22	MONTH 4	YEAR 91
CLASSIFICATION	NO. PGS 4	PRECEDENCE	REMARKS:		
SPACE BELOW FOR COMMUNICATIONS CENTER USE ONLY					
DA FORM 3918-R 1 AUG 72					

U.S. ARMY CORPS OF ENGINEERS

JACKSONVILLE DISTRICT

Panama City Regulatory
Field Office
90JF60075

July 2, 1990

Mr. Jeffrey L. Peterman
Carter & Burgess, Inc.
Post Office Box 2973
Fort Worth, Texas 76113

Dear Mr. Peterman:

This letter is in response to your request dated May 29, 1990, regarding U.S. Army Corps of Engineers' (CE) jurisdiction over wetlands and waters of the United States at the site of the proposed expansion of the commissary at Eglin A.F.B. The proposed project also includes the construction of three stormwater retention ponds, one of which will be drained to Lower Memorial Lake by a stormwater discharge structure. The project is located in Section 26, Township 1 South, Range 23 West, Okaloosa County, Florida.

The attached drawing shows the approximate location of the CE jurisdiction line around a pond and its wetlands located on the site. The pond and its wetlands are considered to be isolated. Fill or spoil material placed in isolated wetlands will not need prior written authorization, if the total area of isolated wetlands to be filled or adversely impacted for the entire development is less than 1 acre (pursuant to 33 CFR Part 330.5(a)(26)). This includes fill associated with roads, building pads, septic tanks, and ditch sidecasts. Also included in the total would be wetlands impounded by a dam or dike, and wetlands drained by ditches with sidecasts. For areas of fill or inverse impact of between 1 and 10 acres in isolated wetlands, prior written authorization from the CE is required, and an Individual Department of the Army permit may be required pursuant to the discretion of the Division Engineer. Authorization for more than one acre of fill in isolated wetlands requires submittal to this office of adequate drawings showing the extent of the proposed fill.

The proposed stormwater outfall structure associated with the South Pond and Lower Memorial Lake may qualify for one of our General Permits. Enclosed with this letter is an application booklet for your use. Application drawings for the outfall structure should include plan and side view drawings showing the location of the structure in relation to the ordinary high water line of the lake.

Please be advised that this jurisdictional determination reflects current policy and regulations and is valid for a period no longer than two years from the date of this letter. If after the two year period, this jurisdictional determination has not been specifically revalidated by the CE, it shall automatically expire.

If you have any questions regarding the above, please contact Mr. Hambrick by writing to the letterhead address or by telephone at (904)763-0717.

Sincerely,

Kevin D. O'Kane

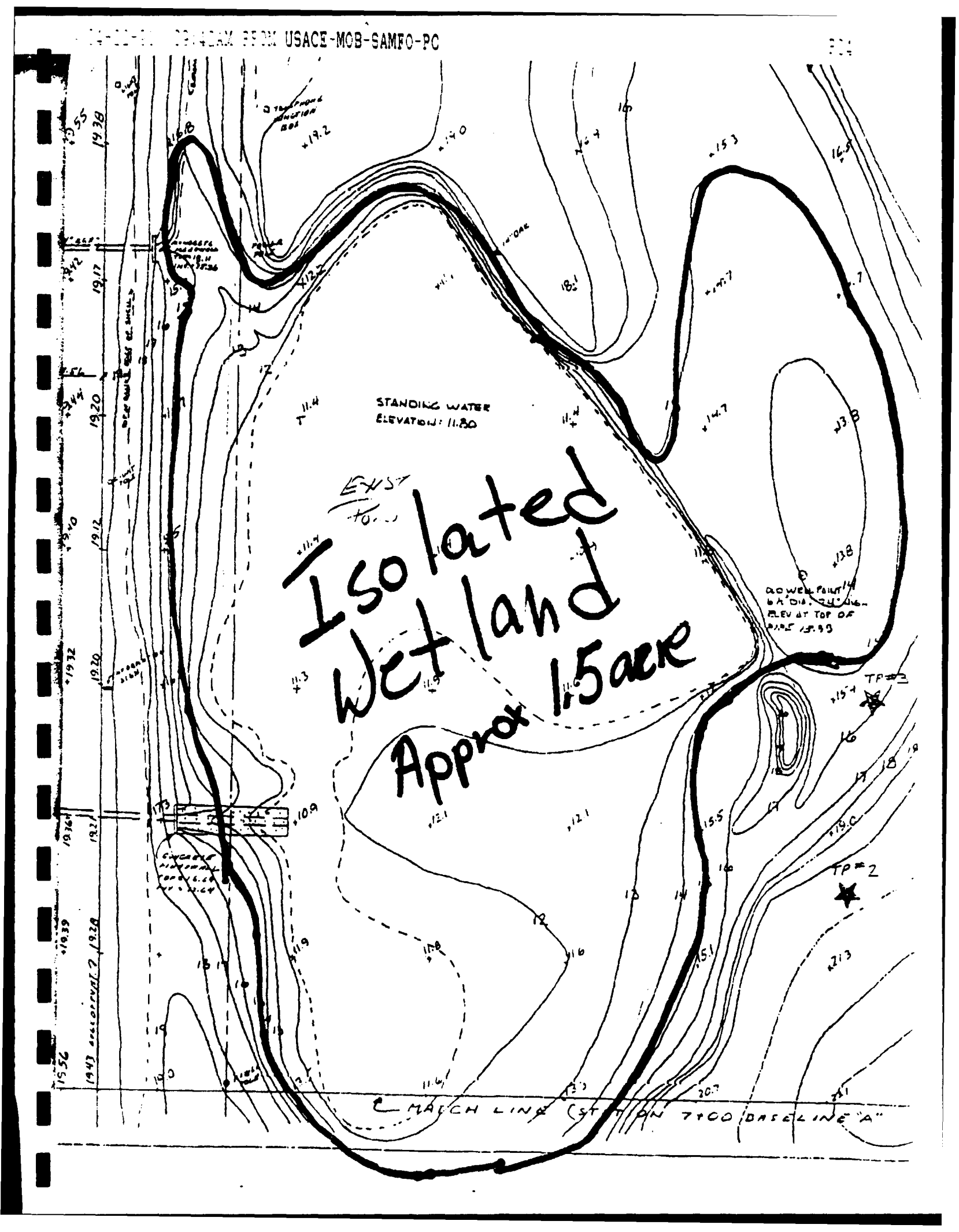
Kevin D. O'Kane
Chief, Panama City Regulatory
Field Office

Enclosure

Copy Furnished:
DER, Pensacola

Hambrick/dh
O'Kane

complete date: 20 Jun 90


STANDING WATER
ELEVATION: 11.80
Isolated
Wetland
Approx 1.5acre
TP#2
TP#3
MARCH LINE (STATION 7+00 BASELINE "A"

APPENDIX IV

Jurisdictional Determination

Florida Department of Environmental Regulation
Letter dated May 20, 1991

Florida Department of Environmental Regulation

Northwest District • 160 Governmental Center • Pensacola, Florida 32501-5794

Lawton Chiles, Governor

Carol M. Browner, Secretary

MAY 20 1991

Lt. Colonel F. Thomas Lubozynski
Chief, Environmental Protection Division
Headquarters 3200 th Support Wing
Eglin Air Force Base, Florida 32542

Dear Colonel Lubozynski:

This is in response to your request for an informal jurisdictional determination on property located on Eglin Air Force Base (see attached drawing).

The site labeled Area A on the attached map appears to be a borrow pit which has developed wetland vegetation. The area is not connected to surface waters of the state and, therefore, does not fall within this Department's wetland jurisdiction pursuant to Florida Administrative Code Chapter 17-301. Area B is not characterized by wetland vegetation and also does not fall within the Department's wetland jurisdiction. No permit is required from this Department for dredging, filling or construction on these sites as long as no connection to surface waters is established.

You should contact Don Hambrick of the U.S. Army Corps of Engineers at (904) 763-0717 in Panama City to determine any Federal wetland regulations which may apply.

This is an informal preapplication jurisdictional determination pursuant to Section 403.914(2), Florida Statutes (1984). It does not bind the Department, its agents or employees, nor does it convey any legal rights, expressed or implied. Persons obtaining this informal preapplication jurisdictional determination are not entitled to rely upon it for purposes of compliance with Section 403.913, Florida Statutes (1984), nor any other provision of law or Department rules. A binding jurisdictional determination may be obtained by petitioning the Department for a jurisdictional declaratory statement pursuant to F.A.C. Rule 17-312.040 or by applying for a Wetlands Management permit.

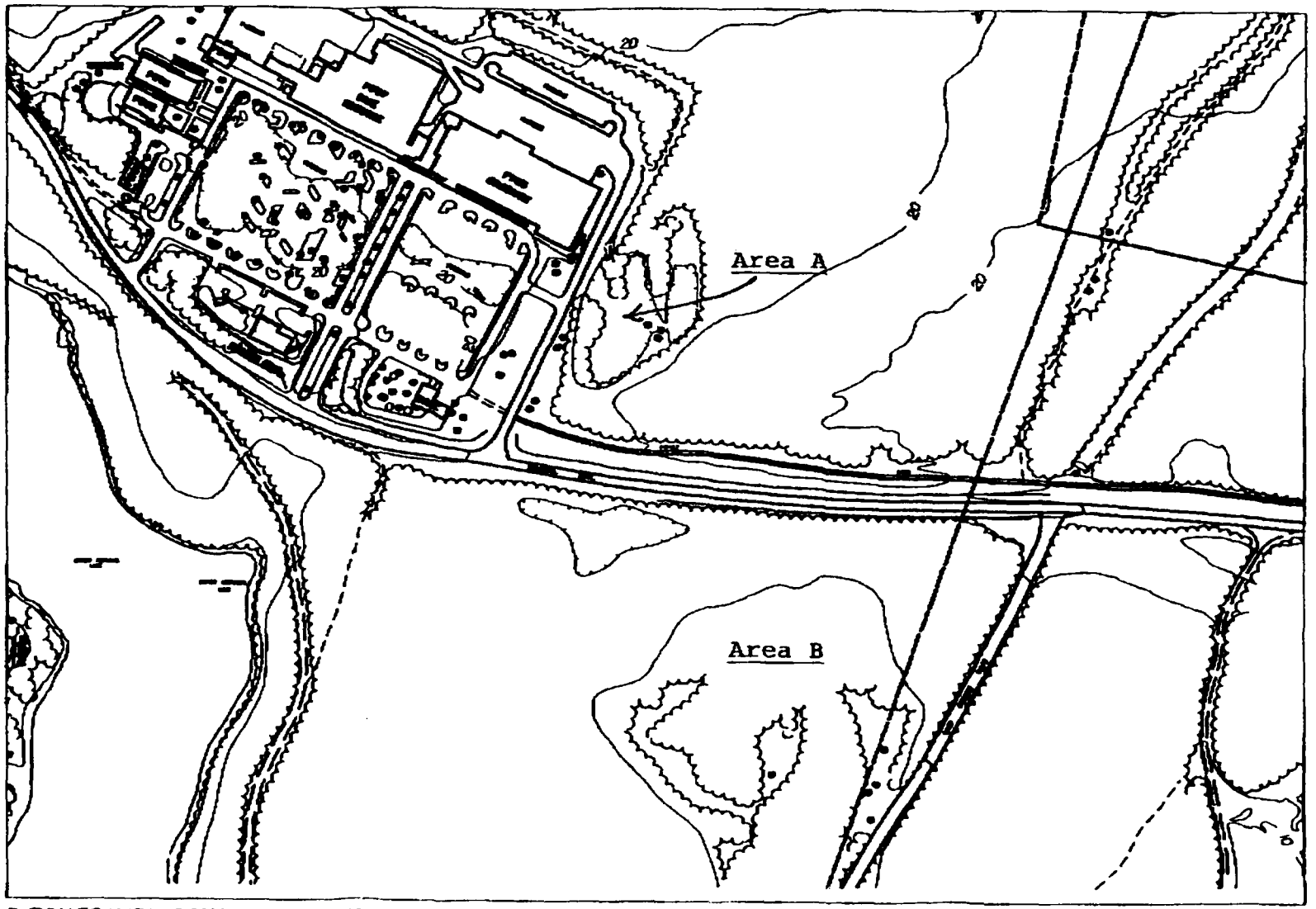
Please contact Charles Harp at 436-8320 if you have any further questions.

Sincerely,

John P. Kerr, Ph.D.
Wetlands Management Supervisor

JPK:chg
Attachment

EGLIN COMMISSARY EXPANSION



D:/DGN/EG406P1A.DGN May. 16, 1991 13:41:47 1"=400'

APPENDIX V

Guidelines for Protection/Creation of Wetlands

- Executive Order 11990 — 24 May 1977
- Air Force Regulations 19-9 Chapter 5 — 14 February 1986

EXECUTIVE ORDER 11990

Protection of Wetlands

By virtue of the authority vested in me by the Constitution and statutes of the United States of America, and as President of the United States of America, in furtherance of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq.*), in order to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative, it is hereby ordered as follows:

Section 1. (a) Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

(b) This Order does not apply to the issuance by Federal agencies of permits, licenses, or allocations to private parties for activities involving wetlands on non-Federal property.

Sec. 2. (1) In furtherance of Section 101 (b) (3) of the National Environmental Policy Act of 1969 (42 U.S.C. 4331 (b) (3)) to improve and coordinate Federal plans, functions, programs and resources to the end that the Nation may attain the widest range of beneficial uses of the environment without degradation and risk to health or safety, each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding the head of the agency may take into account economic, environmental and other pertinent factors.

(b) Each agency shall also provide opportunity for early public review of any plans or proposals for new construction in wetlands, in accordance with Section 2(b) of Executive Order No. 11514, as amended, including the development of procedures to accomplish this objective for Federal actions whose impact is not significant enough to require the preparation of an environmental impact statement under Section 102 (2) (C) of the National Environmental Policy Act of 1969, as amended.

Sec. 3. Any requests for new authorizations or appropriations transmitted to the Office of Management and Budget shall indicate, if an action to be proposed will be located in wetlands, whether the proposed action is in accord with this Order.

Sec. 4. When Federally-owned wetlands or portions of wetlands are proposed for lease, easement, right-of-way or disposal to non-Federal public or private parties, the Federal agency shall (a) reference in the conveyance those uses that are restricted under identified Federal, State or local wetlands regulations; and (b) attach other appropriate restrictions to the uses of properties by the grantee or purchaser and any successor, except where prohibited by law; or (c) withhold such properties from disposal.

Sec. 5. In carrying out the activities described in Section 1 of this Order, each agency shall consider factors relevant to a proposal's effect on the survival and quality of the wetlands. Among these factors are:

(a) public health, safety, and welfare, including water supply, quality, recharge and discharge; pollution; flood and storm hazards; and sediment and erosion;

(b) maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources; and

(c) other uses of wetlands in the public interest, including recreational, scientific, and cultural uses.

Sec. 6. As allowed by law, agencies shall issue or amend their existing procedures in order to comply with this Order. To the extent possible, existing processes, such as those of the Council on Environmental Quality and the Water Resources Council, shall be utilized to fulfill the requirements of this Order.

Sec. 7. As used in this Order:

(a) The term "agency" shall have the same meaning as the term "Executive agency" in Section 105 of Title 5 of the United States Code and shall include the military departments; the directives contained in this Order, however, are meant to apply only to those agencies which perform the activities described in Section 1 which are located in or affecting wetlands.

(b) The term "new construction" shall include draining, dredging, channelizing, filling, diking, impounding, and related activities and any structures or facilities begun or authorized after the effective date of this Order.

(c) The term "wetlands" means those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.

Sec. 8. This Order does not apply to projects presently under construction, or to projects for which all of the funds have been appropriated through Fiscal Year 1977,

or to projects and programs for which a draft or final environmental impact statement will be filed prior to October 1, 1977. The provisions of Section 2 of this Order shall be implemented by each agency not later than October 1, 1977.

Sec. 9. Nothing in this Order shall apply to assistance provided for emergency work, essential to save lives and protect property and public health and safety, performed pursuant to Sections 305 and 306 of the Disaster Relief Act of 1974 (88 Stat. 148, 42 U.S.C. 5145 and 5146).

Sec. 10. To the extent the provisions of Sections 2 and 5 of this Order are applicable to projects covered by Section 104(h) of the Housing and Community Development Act of 1974, as amended (88 Stat. 640, 42 U.S.C. 5304 (h)), the responsibilities under those provisions may be assumed by the appropriate applicant, if the applicant has also assumed, with respect to such projects, all of the responsibilities for environmental review, decision-making, and action pursuant to the National Environmental Policy Act of 1969, as amended.

/s/ Jimmy Carter

THE WHITE HOUSE,
May 24, 1977

[FR Doc. 77-15123 Filed 5-24-77; 1:44 pm]

DEPARTMENT OF THE AIR FORCE
Headquarters US Air Force
Washington DC 20330-5000

AF REGULATION 19-9

14 February 1986

Environmental Planning

INTERAGENCY AND INTERGOVERNMENTAL COORDINATION OF LAND, FACILITY, AND ENVIRONMENTAL PLANS, PROGRAMS, AND PROJECTS

This publication explains the policies, procedures, and responsibilities for the Air Force interagency and intergovernmental coordination of land, facility, and environmental plans, programs, and projects. It implements Department of Defense Instructions (DODI) 4165.57, 8 November 1977, and 4165.59, 29 December 1975, and Change 1; and DOD Directives (DODD) 4165.61, 9 August 1983, and 5030.17, 6 November 1978. This publication applies to personnel at all Air Force installations, facilities, and activities, and to contractor activities performed in Air Force-owned industrial facilities within the United States and its territories. Any comments, recommendations, or proposed changes for this publication must be sent through channels to the Deputy Chief of Staff Logistics and Engineering, Directorate of Engineering and Services, Environmental Division (HQ USAF/LEEV), Wash DC 20332-5000.

Supersedes AFR 19-9, 15 September 1980. (See signature page for summary of changes.)
No. of Printed Pages: 51
OPR: LEEV (Mr Boris F. Sevcik)
Approved by: Maj Gen Clifton D. Wright
Writer-Editor: Mrs Ruthy Sturgill
Distribution: F

Chapter 5

FLOODPLAIN MANAGEMENT AND WETLANDS PROTECTION

5-1. Air Force Actions on Floodplains and Wetlands. This chapter applies to all Air Force actions on floodplains and wetlands.

5-2. Regulatory Basis:

a. Executive Orders 11988, Floodplain Management, and 11990, Protection of Wetlands, result from recognizing that the natural and beneficial values of the nation's floodplains and wetlands must be restored and preserved. Floodplains and wetlands in their natural or relatively undisturbed state have high water resources value (for natural moderation of floods, water quality maintenance, and ground water recharge), cultural resources value (for open space, natural beauty, scientific study, outdoor education, and recreation), and natural resources value (for fish, wildlife, agriculture, and forestry). The objectives of the two orders are to avoid the adverse impacts associated with the occupancy and modification of floodplains, the direct or indirect support of development on floodplains, the destruction or modification of wetlands, and the direct or indirect support of new construction on wetlands. The orders require each agency to provide leadership and take action to:

(1) Reduce the risk of flood loss.

(2) Minimize the impact of floods on human safety, health, and welfare.

(3) Minimize the destruction of wetlands.

(4) Preserve and enhance the natural and beneficial values of both floodplains and wetlands.

b. The U.S. Water Resources Council (WRC) has published floodplain management guidelines for complying with EO 11988. The guidelines contain an analysis of the Executive Order, information on floodplain management concepts, explanations of key terms, and a decision-making process.

NOTE: The handbook is available from the U.S. Government Printing Office, Wash DC 20402. The WRC has been disestablished and the guidelines are now sponsored by the Floodplain Management Services and Coastal Resources Branch, Directorate of Civil Works, US Army Corps of Engineers.

c. DOD Manual 4270.1, Construction Criteria, implements both EOs 11988 and 11990 for military operations and maintenance, military construction programs, minor construction, family housing, and nonappropriated fund construction projects.

5-3. Terms Explained. See attachment 1.

5-4. Responsibilities Assigned:

a. SAF/MIQ. Establishes overall floodplain management and wetlands protection policy and oversees its implementation.

b. HQ USAF/LEEV:

(1) Provides policy and management oversight for floodplain management and wetlands protection.

(2) Coordinates floodplain and wetlands activities with Department of Defense components and other Federal agencies.

c. HQ AFESC/DEV:

(1) Provides policy input, legislative analysis, technical consultation, and guidance for managing floodplains and wetlands.

(2) Coordinates floodplain and wetlands activities with HQ USAF/LEEV, AFRCEs, and MAJCOMs.

d. AFRCEs:

(1) Perform overall floodplain and wetlands coordination for the Air Force with state agencies, federal regional agencies, HQ USAF/LEEV, HQ AFESC/DEV, MAJCOMs, and installations.

(2) Assist installations on all floodplain and wetland matters.

e. MAJCOMs (Including the Air Force Reserve and the National Guard):

(1) Ensure that all installations fulfill the requirements of EOs 11988 and 11990 and the provisions of this regulation.

(2) Maintain liaison with HQ USAF/LEEV, HQ AFESC/DEV, and AFRCEs.

f. Installations:

(1) Use the decisionmaking process described in the WRC floodplain management guidelines for actions (see paragraph 5-2b).

(2) Make notifications under EO 12372 to "state process" designated state and local review bodies and make public notice in at least one local newspaper. Consider comments before initiating actions that affect floodplains or wetlands.

(3) Inform AFRCEs and MAJCOMs of local and regional floodplain and wetland activities.

(4) Consider floodplain and wetlands requirements in installation planning and decision making.

5-5. Designation of Floodplains and Wetlands. Installations designate floodplains and wetlands on all Air Force-owned land:

a. Use the WRC guidelines and obtain assistance from the District Office of the U.S. Army Corps of Engineers, as needed, to determine the floodplain location.

b. Contact the local or state office of the USDA Soil Conservation Service or the US Fish and Wildlife Service regional office for technical assistance in identifying wetlands.

c. Identify all floodplains and wetlands in the installation comprehensive plan and land management plan. Ensure these plans provide for protecting and managing these areas.

5-6. Decisionmaking. Decisionmaking is conducted according to the WRC guidelines. (Follow the guidelines in a through i below.) This may be accomplished as part of the environmental impact analysis process.

a. Determine if the proposed action is in a floodplain or wetland.

b. Provide, for public review, the notice of intent to locate the proposed action in the floodplain or wetland. Also, send it through any state and local review processes established pursuant to EO 12372.

c. Identify and evaluate practicable alternatives to locating the proposed action in the floodplain or wetland.

d. Determine whether the action has impacts in floodplains or wetlands or if the action directly or indirectly supports development in floodplains or new construction in wetlands.

e. Describe actions to be taken to minimize the adverse effects of identifiable impacts and to restore and preserve natural and beneficial floodplain and wetland values.

f. Reevaluate the alternatives. Take the impacts into account.

g. If the only practicable alternative is to locate the action in a floodplain or wetland, give public notice and make any pertinent EO 12372 notifications. State the reasons for this finding, including the alternatives considered. The public statement must include the items listed in the WRC floodplain management guidelines.

h. The proposed action may be implemented only after the EO 12372 review and any required environmental impact analysis. Follow the procedures in AFRs 86-1, 86-4, 87-1, and 87-3; and AFM 88-15.

i. Installations having all or most of their land in a 100-year floodplain may consider more than one action in a single review process where compliance with the intent of EOs 11988 and 11990 will not be diminished.

5-7. Certification Statements. The project books and DD Forms 1391c prepared for construction projects must indicate whether the projects are sited in wetlands or floodplains and, if so, whether compliance with EOs 11988 and 11990 is in progress or has been achieved. AFRs 86-1 and 89-1 provide guidance for preparing environmental certification statements.

APPENDIX VI

Biological Assessment

Woodward-Clyde
May 1991

Central Florida Operations
1314 Fairlee Street
Lakeland, Florida 33813
813 646-5804
Fax: 813-646-5838

Woodward-Clyde Consultants

June 5, 1991

Mr. Richard A. Hartman
Senior Consultant
Woodward-Clyde Federal Services
2014B Lewis Turner Boulevard
Fort Walton Beach, Florida 33813

RE: Letter of Transmittal
Biological Assessment, Eglin AFB Commissary Addition

Dear Mr. Hartman:

Woodward-Clyde Consultants is pleased to submit the Biological Assessment Report for the Commissary expansion at Eglin AFB. A field survey and examination of existing data on the proposed sites was made in May, 1991. The enclosed report summarizes the field survey and existing biological resources, and gives an evaluation of potential impacts of the proposed expansion. Based upon this assessment, there do not appear to be any significant long-term adverse impacts to biological resources of the region or to federally listed threatened or endangered species as a result of this action.

Please feel free to contact me with any questions or for any assistance. Woodward-Clyde Consultants appreciates this oportunity to be of service to the U. S. Air Force and to you.

Sincerely,
Woodward-Clyde Consultants

Stephen W. Fletcher, Ph.D.
Assistant Project Scientist

Enclosure

cc: C. Richard Murphy, Woodward-Clyde Consultants

BIOLOGICAL ASSESSMENT

COMMISSARY EXPANSION SITES
EGLIN AFB

May 20, 1991

Prepared by

Woodward-Clyde

202 Lake Miriam Drive
Lakeland, Florida 33813
(813) 646-5804

TABLE OF CONTENTS

1.0 INTRODUCTION

This report is an evaluation of the ecological resources contained in the proposed commissary alterations site at Eglin Air Force Base. The primary site area that has been evaluated consists of approximately five acres of upland wooded habitat east of the existing warehouse and behind (northeast) of the warehouse, and an approximately 2.5-acre area south and east of the existing warehouse that contains uplands and a wetland area.

This biological assessment also evaluated an area south of Memorial Trail and west of Camp Robbins Road that may be used for an additional retention or wetland mitigation area, as well as an area between Memorial Trail and Memorial Lake that also may be used as a retention pond area depending on the alternative selected.

2.0 METHODOLOGY

The assessment was made on the basis of available literature, prior data from the site, and a field survey of the proposed areas on May 14, 1991. Literature and existing sources consulted included the Environmental Impact Assessment Inventory Database for Eglin AFB (USAF, 1976), the Official Lists of Endangered and Potentially Endangered Fauna and Flora in Florida (Florida Game and Fresh Water Fish Commission, 1990), and the six volume set, Rare and Endangered Biota of Florida (Pritchard, ed., 1978).

This assessment is a continuation of previous site assessment and regulatory agency review initiated by the Eglin Air Force Base Natural Resources Branch. Previous activities initiated by the Natural Resources Branch include notification of the U. S. Fish and Wildlife Service (FWS), the U.S. Army Corps of Engineers (COE), and the Florida Department of Environmental Regulation (FDER). Personnel from each of these agencies have surveyed the site along with personnel from the Natural Resources Branch.

The site was also assessed during a field survey on May 14, 1991 by Woodward-Clyde Consultants (WCC). This field assessment included a qualitative walk-through and drive-through of the site during the morning and early afternoon, in which general conditions were noted and the site was characterized in terms of soils, vegetation communities, and wildlife habitat.

Further field surveys were conducted in afternoon and evening hours to more fully document the ecological resources and condition of the site. These consisted of pedestrian surveys along transects through the upland areas of the site and of point count surveys of the wetland/retention pond.

A total of five transects were walked on the upland area proposed for construction of the new commissary facilities. These transect locations are shown in Figure 2-1. Each transect was approximately 200 ft long. An area of approximately 30 ft on either side of the centerline was surveyed for the presence of listed threatened or endangered plant species, and signs of animal activity such as nests, burrows, and tracks. This resulted in survey coverage of approximately 1.3 of the 6 acres (22%) of the upland area that may be affected by any of the alternatives under consideration. At three equi-distant points along each transect, soils and vegetation were qualitatively characterized. Observations included plant species present and estimated aerial coverage in the overstory, understory, shrub, and herbaceous layers within a 30 ft radius of the sampling point. In addition notes were made on the approximate size distribution (stem diameter, height) of trees within the sample area. Five minutes were spent at each point listening for wildlife sounds and calls.

The circumference of the wetland/retention pond was walked twice. A total of 6 spot count points were used to observe and listen for wildlife within the wetland. The entire wetland area was surveyed in this manner. Five minutes were spent at each point.

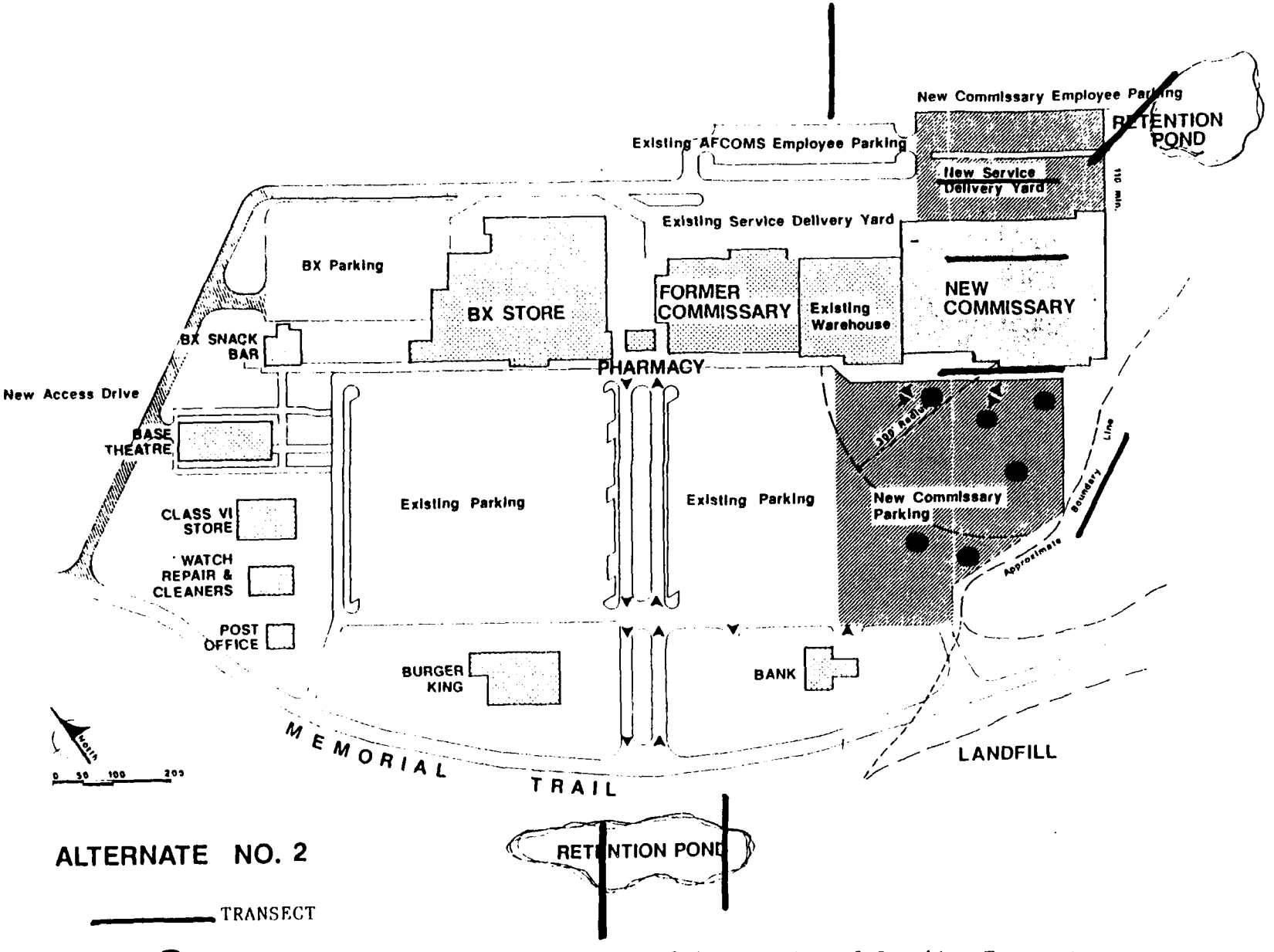


Figure 2-1 Location of Sampling Transects and Stations

An additional pedestrian transect was made on the landfill area southeast of the proposed site in order to compare vegetation and habitat. This consisted of a single 200 ft transect oriented in a east-west manner.

Additional pedestrian transects were located between Memorial Trail and Memorial Lake (2 transects) and through the low area approximately 200 ft west of the intersection of Memorial Trail and Camp Robbins Road (2 transects). A survey cut approximating the location of a possible drainage swale from the project site to the low area was also examined.

3.0 RESULTS

3.1 Vegetation

Table 3.1 shows a summary of the vegetation data obtained from the 15 upland survey points in the proposed site area. The overstory is dominated by sand pine with turkey oak as the principal associated species. The understory is also dominated by turkey oak at most points.

The results of this survey show that the uplands of the proposed site match closely the characteristics of the Sand pine-Turkey Oak Association as described in the Environmental Impact Assessment Inventory Database (USAF, 1976), which states that this is the predominant vegetation type throughout much of southern Walton County. That report characterizes this community as commonly having species such as sand pine, turkey oak, blue jack oak, and sandhill haw.

Towards the north end of the proposed site, the vegetation tends to become slightly more characteristic of the Turkey Oak-Sand Pine-Longleaf Pine Association, with an increased occurrence of longleaf and slash pines, tree sparkleberry, indiangrass, and bracken fern. A greater abundance of live oak occurs in the overstory in this area. This community is described in the Baseline Inventory as

Table 3.1. Vegetative Composition of Upland Sites for Proposed Commissary Expansion.

Common Name	Scientific name	Rel. Cov. %	Rel. Freq. %	Rel. Dom. %
Overstory				
Sand pine	Pinus clausa	48.0	33.3	40.7
Turkey oak	Quercus laevis	24.0	22.2	23.1
Slash pine	Pinus elliottii	7.4	16.7	12.0
Bluejack oak	Quercus incana	6.6	11.1	8.9
Sand live oak	Quercus geminata	7.0	8.3	7.7
Live oak	Quercus virginiana	4.0	5.7	4.9
Chapman oak	Quercus chapmanii	3.0	2.7	2.8
Understory				
Turkey oak	Quercus laevis	59.3	28.9	44.1
Sand pine	Pinus clausa	18.8	28.9	23.9
Bluejack oak	Quercus incana	10.0	17.7	13.9
Chapman oak	Quercus chapmanii	4.6	6.6	5.6
Sand live oak	Quercus geminata	1.8	4.4	3.1
Persimmon	Diospyros virginiana	1.8	4.4	3.1
Sandhill haw	Crataegus lacrimata	0.6	4.4	2.5
Winged sumac	Rhus glabra	1.5	2.2	1.9
Live oak	Quercus virginiana	1.5	2.2	1.9

Table 3.1. Vegetative Composition of Upland Sites for Proposed Commissary Expansion.

Common Name	Scientific name	Rel. Cov. %	Rel. Freq. %	Rel. Dom. %
Shrub				
Saw palmetto	Serenoa repens	38.6	15.3	27.0
Dwarf wax myrtle	Myrica pumila	28.5	14.1	21.3
Sand Pine	Pinus clausa	8.3	10.6	9.5
Turkey oak	Quercus laevis	6.0	9.4	7.7
Tree sparkleberry	Vacinium arboreum	5.5	8.2	7.3
Sandhill haw	Crataegus lacrimata	4.7	8.2	6.5
Chapman oak	Quercus chapmanii	2.1	2.4	2.2
Runner oak	Quercus pumila	2.1	2.4	2.2
Grape	Vitis sp.	0.9	5.9	3.4
Bluejack oak	Quercus incana	0.8	4.7	2.7
Greenbrier	Smilax spp.	0.6	3.5	2.0
American beautyberry	Callicarpa americana	0.6	3.5	2.0
False buckthorn	Bumelia lanuginosa	0.6	3.5	2.0
Staggerbush	Lyonia ferruginea	0.4	2.4	1.4
Yaupon	Ilex vomitoria	0.2	1.2	0.7
Southern magnolia	Magnolia grandiflora	0.2	1.2	0.7
Spanish dagger	Yucca aloifolia	0.2	1.2	0.7
Live oak	Quercus virginiana	0.2	1.2	0.7
Winged sumac	Rhus glabra	0.2	1.2	0.7

Table 3.1. Vegetative Composition of Upland Sites for Proposed Commissary Expansion.

Common Name	Scientific name	Rel. Cov. %	Rel. Freq. %	Rel. Dom. %
Herbs				
Bahia grass	Paspalum notatum	27.6	3.6	15.6
Oaks	Quercus spp.	16.4	14.5	15.5
Dwarf wax myrtle	Myrica pumila	20.6	4.8	12.7
Lichen	Cladonia sp.	13.4	9.6	11.0
Broomsedge	Andropogon sp.	7.2	6.0	6.6
Sand pine	Pinus clausa	0.6	8.4	4.5
Greenbrier	Smilax sp.	0.5	7.2	3.8
Partridge-pea	Cassia fasciculata	1.2	6.0	3.6
Tree sparkleberry	Vaccinium arboreum	0.4	6.0	3.2
Grape	Vitis sp.	1.2	4.8	3.0
Wiregrass	Aristida stricta	4.5	1.2	2.9
Gopher apple	Licania michauxii	0.4	4.8	2.6
Sensitive brier	Schrankia microphylla	0.3	3.6	2.0
Adam's needle	Yucca filimentosa	1.0	2.4	1.7
Bermudagrass	Cynodon dactylon	1.0	2.4	1.7
Prickly-pear cactus	Opuntia humifusa	1.0	2.4	1.7
Persimmon	Diospyrus virginiana	0.9	1.2	1.0
Sweet goldenrod	Solidago odora	0.2	2.4	1.3
Indiangrass	Sorghastrum sp.	0.1	1.2	0.7

Table 3.1. Vegetative Composition of Upland Sites for Proposed Commissary Expansion.

Common Name	Scientific name	Rel. Cov. %	Rel. Freq. %	Rel. Dom. %
Herbs - continued				
Frost aster	Aster pilosus	0.1	1.2	0.7
Sedge	Cyperus sp.	0.1	1.2	0.7
Pinelands baptisia	Baptisia lanceolata	0.1	1.2	0.7
Virginia creeper	Parthenocissus quinquefolia	0.1	1.2	0.7
Rabbit-bells	Crotalaria rotundifolia	0.1	1.2	0.7
Beak rush	Rhyncospora sp.	0.1	1.2	0.7
American beautyberry	Callicarpa americana	0.1	1.2	0.7

typical of much of southern Walton and eastern Okaloosa counties.

The vegetation along the route of the possible drainage swale is similar to that on the primary site, but it has even more evidence of disturbance such as large open spaces and areas dominated by secondary successional species such as bramble (Rubus sp.) and grape.

Vegetation in the possible mitigation area near Camp Robbins Road is dominated by herbaceous and shrub species. Bramble, dog fennel (Eupatorium capillifolium), and broomgrass are the dominant species in much of the area. Groundsel bush (Baccharis halimifolia) and persimmon are common shrubs. A portion of this area was found to have standing water during the field survey. The area of standing water coincided with the areal extent of a 0.25" to 4" thick coating of organic matter and sediments on the soil surface. Consultation with the former chief of the base environmental section (R. Hartman, personnel communication) indicated that this material was dredged sediments that had washed into the area from an adjacent deposition area.

The final area surveyed was the area between Memorial Trail and Memorial Lake. This area was also found to be largely typical of the Sand Pine-Turkey Oak Association, but it grades more readily into the Turkey Oak-Longleaf Pine and Xeric Hammock Associations. The area has a greater species diversity than the other upland areas surveyed, including such species as pignut hickory (Carya glabra), American beautyberry, and laurel oak (Quercus laurifolia). Cover was also greater in the understory, shrub, and herb strata. Larger live and laurel oaks were more characteristic of this area than other areas.

3.2 Wildlife

Wildlife utilization noted during the field transects of the proposed commissary site included 4 green anoles, 3 grey squirrel nests, 1 mammal burrow (probably armadillo) and armadillo forage diggings. Birds seen or heard were several cardinals and common grackles, one brown thrasher, one wood thrush, one blue jay, several English sparrows, and one mockingbird. All of these are common species often associated with areas of high human activity.

The proposed commissary site also has a relatively low abundance of browse plants, of dead standing trees, and of dead wood on the ground. Few acorns were noted in relation to the abundance of oaks in the area. These factors all indicate a low capacity for wildlife nesting and forage in the area.

The wetland/retention pond area appeared to have only moderate utilization by wildlife. Observations from the spot count locations and other observations indicated only 6 ground doves, 6 red-winged blackbirds, 1 great blue heron, 2 green herons, and 1 little blue heron. No evidence of reptile or mammal use was noted, and no avian nests were noted adjacent to or in the pond.

Wildlife utilization of the areas south of Memorial Trail appeared to be greater. Numerous deer tracks were noted as were several squirrel nests, and several signs of mammal scat, probably raccoon. The greater abundance

of mast (nut)-producing oaks, greater herbaceous cover, and greater abundance of browse and berry species probably contribute to increased utilization of this area.

3.3 Threatened, Endangered, and Special Interest Species

Only three animal species listed by the U. S. FWS as threatened or endangered are known to occur in significant numbers within southern Okaloosa County. These are the Okaloosa darter (Etheostoma okaloosae), the Atlantic loggerhead turtle (Caretta caretta), and the red-cockaded woodpecker (Picoides borealis). The loggerhead turtle is a strictly marine species, while the Okaloosa darter is a fish of flowing waters and is found only in seven drainages in Okaloosa and Walton Counties (EIA Inventory Database). The isolated non-flowing wetland on this site therefore is not suitable habitat for these two species.

The nearest known red-cockaded woodpecker colony is approximately one-half mile west in a more open habitat near the Ben's Lake Housing Area. The site proposed for the commissary expansion does not offer suitable habitat for this species for several reasons. First, there are very few longleaf pines in the project area, and none of them appear to have the red-heart disease of mature pines that is required for nest cavity trees. Secondly, the understory and shrub layers of vegetation are generally too dense and tall to provide suitable foraging habitat for this species. Therefore, the site is not considered to be suitable habitat for this species.

On May 10, 1990, Mr.Troxell of the U. S. FWS conducted a survey of the site in association with Mr. Rick McWhite of the Eglin AFB Natural Resources Branch. Attached to this report is a letter (Attachment 1) from Mr. McWhite, the Air Force Agency representative, which summarizes the survey and the conclusions stated by Mr.Troxell that the area does not offer suitable habitat. Mr McWhite's letter also states that there is an existing agreement in effect between the Air Force and the FWS that delegates determination of consultation need authority to the Natural Resources Branch. Thus Mr. McWhite's letter fulfills all consultation needs from the FWS, and establishes the determination that the area is not

suitable habitat and does not require further Section 7 endangered species consultation.

Other federally listed threatened or endangered animal species that may occur occasionally in Okaloosa County are the eastern indigo snake (Drymarchon corais couperi)(T), wood stork (Mycteria americana)(E), roseate tern (Sterna dougallii)(T), southern bald eagle (Haliaeetus leucocephalis)(E), and Choctatawhatchee beach mouse (Peromyscus polionotus allophrys)(E). The site contains no suitable habitat for any of these species except perhaps the eastern indigo snake. However, the amount of habitat required for species usually is very large (i.e. 500 acres - D. Powell, Florida Game & Fresh Water Fish commission, pers. com.) so amount of habitat on the site is insignificant and incapable of supporting this species.

No listed plant species were seen during the May 14, 1991 field survey.

3.4 Wetland Resources

The single wetland resource on the site is a 1.5 acre wetland. This is an isolated wetland with no discharge point. It was created in the 1960's as a borrow pit for soil cover for the D2 landfill. It has been used as a retention basin for runoff from the parking lot and roof of the commissary/BX complex since 1979. The retention capacity of the pond has been calculated as 3.6 acre-ft.

This wetland has depths up to 4 ft below the surrounding grade. During the spring season of 1991, water depths of 3 to 4 ft occurred in some parts of the wetland. This water depth has been reported to be an unusual event due to the unusually heavy rainfall during this period. In normal rainfall years, the area has been reported to be dry for much of the year, flooding only in response to rainfall events.

Vegetation in the deepest zones consists of scattered water lily (Nymphaea odorata). Cattail (Typha latifolia) covers about 25% of the pond, as does black willow (Salix nigra). Maximum stem diameter of the willows is about

4", indicating a fairly young developmental stage. Maidencane (Panicum hemitomon), torpedo grass (P. repens), and bahia grass (Paspalum notatum) are the other major species of the wetland. The presence of the bahia grass indicates that much of the wetland is often dry.

Appendix III of the basic document is a July 2, 1990 letter from Kevin D. O'Kane, Chief of the Panama City Regulatory Branch of the Corps of Engineers, submitted as a response to consultation by the Air Force. This letter has established the area of wetland subject to COE dredge and fill permit requirements as being of 1.5 acres. The amount of area and volume area to be filled in any of the alternative plans will be sufficiently small to qualify for a nationwide dredge and fill permit, upon written notification to and approval by the District Engineer under 33 CFR Part 330. The COE has determined that activities covered under nationwide permits do not constitute significant impacts to wetlands.

4.0 EVALUATION OF BIOLOGICAL RESOURCES

Although the vegetation in the wetland is beginning to reach a developmental stage where it could offer some benefit as wildlife habitat, several factors lower its long-term value as a habitat area. The first of these is its nature and use as a retention pond. The high variability and rapid fluctuation of water level make it difficult for this system to develop long-term stability as a habitat. Although some fish (sunfish family) are currently present in the pond, the population may not be stable due to the tendency of the pond to dry out in very dry periods. Thus the pond may not be a dependable long-term foraging area for wading birds and other wetland-dependent species. A second factor is the proximity of the pond to the existing commissary area and the high degree of human disturbance.

Vegetation of the wetland shows a low degree of diversity and is dominated by species typical of disturbed or early successional systems.

The adjacent uplands are similar in nature to the most abundant vegetation community in southern Okaloosa and Walton Counties. The 5 to 8 acres of

habitat that might be affected, depending on alternative selected, constitute an insignificant (less than 0.02%) portion of the habitat in the county.

No impacts on federally listed threatened or endangered species are projected due to the lack of significant habitat for any of these species in the project area.

5.0 WETLAND MITIGATION

Filling or alteration of the 1.5-acre wetland will require compensation in the form of mitigation or restoration as a part of the permit approval process. Due to the generally low functional value of the wetland as plant and animal habitat, as well as the hydrologic isolation, man-made origin, young age of the system, low plant diversity, weedy nature of many currently existing species, and proximity to human disturbance, mitigation requirements should not exceed 1.5:1 on an areal basis.

The open area near the intersection of Memorial Trail and Camp Robbins Road (Figure 5.1) contains approximately 3 acres of land available for construction of wetlands for mitigation. Land in excess of 1 acre also occurs to the east and north of the proposed commissary site. These potential mitigation sites are within the drainage basin of the existing wetland and are in similar habitats and soils. Therefore they are suitable as candidate mitigation areas and should be capable of supporting all mitigation requirements.

The Camp Robbins Road area consists of slightly depressed locations where surface soils were removed for capping the landfill. Ground elevations in these areas are about 3" to 5" below adjacent grade. Vegetation in the area consists largely of species found in transitional zones adjacent to wetlands.

A piezometer has been placed in this area to monitoring the elevation of the surficial water table. Data from this piezometer will be used in the design of the mitigation area. The effectiveness of organics or fine

sediments in sealing the surface of the underlying land has already been demonstrated in this location, since it has allowed the development of vegetation similar to that found in wetlands. Thus a minimum of excavation may be required to provide hydric conditions adequate for a permanent wetland.

The soil can be excavated to a point at or near the dry season water table elevation in order to support wetland vegetation throughout the year, and a deeper hole can be constructed to provide for a permanent water zone. Organics or fine clays may be utilized as necessary to seal the bottom and provide better moisture retention in the root zone.

With these conditions, it will be feasible to construct a mitigation wetland in this area sufficient to meet all permitting requirements in terms of required acreage, proximity to the existing wetland, and location within the drainage basin. The location of this area also will enhance the wildlife habitat functions of the wetland. The wetland will be in a more secluded location adjacent to a greater diversity of existing habitats. The wetland will provide foraging and water for wildlife in this location and should create even greater habitat diversity and carrying capacity.

Augmentation of flow to the wetland can be provided by diverting surface runoff that is currently entering the existing wetland. This drainage will be carried to the wetland through a drainage swale or sealed pipes, depending on the amount of water that is required to reach the wetland. This will allow creation of hydroperiod most suitable to the location and to the plant species planted in the wetland. Based upon the estimated 13.1 acre-feet of stormwater runoff from a 10-year storm, it is anticipated that sufficient water resources will be available from lesser events to maintain adequate hydroperiod in the mitigation area. Designing the drainage system to allow for up to 3 acre-ft of runoff to enter the mitigation area per week in the wet season should be sufficient to maintain adequate hydroperiod to support wetland vegetation.

Herbaceous and tree zones may be planted in the mitigation area to provide for a diversity of habitat. All major species of the existing wetland are well adapted for planting and establishment in mitigation areas. Thus conditions and functions of the simple ecosystem of the existing marsh can be readily replicated, an accomplishment that is often not possible when replacing natural wetlands. In this case, additional species preferred for mitigation planting and wildlife utilization can be planted to replace the cattail and other less desirable species found in the existing wetland. Suitable species for this area would include maidencane, soft rush, sand cordgrass, arrowheads, pickerelweed, bacopas, fragrant water lily, buttonbush, wax myrtle, black willow, pond cypress, and black gum.

6.0 IMPACTS TO BIOLOGICAL RESOURCES

Impacts associated with Alternatives 1, 2, and 3 would be essentially identical. These would include the removal of approximately 6 acres of Sand Pine-Turkey Oak upland habitat and 1.5 acres of retention pond/wetland for the commissary and associated parking and stormwater retention areas. This represents an insignificant (<0.02%) part of this habitat type in southern Okaloosa County. An additional 1.5 to 2.5 acres of ruderal or early successional open land near camp Robbins road would be converted into a mitigation wetland.

There would be no long-term loss of wetland habitat since the mitigation area would replace the existing wetland. A short-term loss of wetland habitat would occur until the new wetland reaches the developmental stage of the existing area. Based on the type of vegetation and the age and size of trees in the existing wetland, it is estimated most functions would be replaced within 2 years after construction and that full functional equivalency would be reached within 8 years (time for planted trees to reach equivalent size). There are no significant impacts on threatened or endangered species since the impacted area is not prime habitat for any of these species.

Construction of a retention pond south of Memorial Trail and adjacent to Memorial Lake would result in removal of an additional 2 acres of wooded

habitat grading from Sand Pine-Turkey Oak to Xeric Hammock associations. This would impact somewhat higher quality habitat than that found in the commissary site area. No impacts to federally listed endangered or threatened species are anticipated, but there will be some loss of habitat for species such as whitetail deer.

Impacts associated with Alternative 4 would be somewhat less, since only about 2 acres of upland habitat would be removed for parking facilities. The short term loss of wetland function would be avoided, but the long-term ecological function of the existing wetland may be less than that of the mitigation wetland proposed under Alternatives 1,2, and 3 because of the amount of runoff that would directly enter the wetland and because existing less desirable species such as cattail may increase in abundance.

Alternative 5 would involve slightly greater impacts on upland forested habitats north and east of the existing facilities, since another 1 to 2 acres of forest would be cleared. As with Alternative 4, there would be no loss of wetland habitat, but the long-term result might be a wetland with lower ecological functions than the mitigation wetland proposed under Alternatives 1, 2, and 3.

Impacts from Alternative 6 would be similar to those of Alternative 5, since they would include clearing of a larger area, but no alterations to wetlands. Since this area would consist of a new facility, the impacts would be affecting a previously unaffected site and thus might have a greater ecological effect than the clearing of an equivalent area adjacent to the existing commissary complex.

7.0 SUMMARY AND CONCLUSIONS

Construction of the new commissary facility at Eglin AFB will involve the loss of from 6 to 10 acres of primarily Sand Pine-Turkey Oak habitat, depending on alternative selected. The affected area is typical of the predominant vegetation type of the region and represents an insignificant proportion of available habitat in the county.

Between 1.5 and 2.5 acres of early successional land would be converted into a mitigation wetland under some alternatives. this would result in no net loss of wetlands since the mitigation area would be replacing an existing 1.5 acre wetland. The existing wetland has been inspected by personnel from the Corps of Engineers and determined to consist of 1.5 acres of jurisdictional wetlands under Section 404 permitting. The wetland is covered under Nationwide dredge and fill permitting requirements, which are deemed to have insignificant impacts. The existing wetland is a man-made, isolated wetland originally constructed as a borrow area and since used as a stormwater retention pond. Since the existing wetland is man-made and is less than 20 years old, its structural characteristics and functions can be readily replicated within the mitigation wetland.

Wildlife use of the existing wetland and proposed commissary site(s) was assessed as low to moderate, with few signs of wildlife activity observed. Habitat quality was evaluated as generally low to low-moderate due to a low diversity of habitat types and plant species. Browse and mast production appeared to be low, thus indicating a rather low carrying capacity. Thus the impacts to wildlife populations in the region are rated as low to insignificant. Construction of a retention pond south of Memorial Drive opposite to the main entrance to the commissary facility would impact about 2 acres of forested habitat which is rated of somewhat higher quality than the other areas because of greater diversity, greater isolation, greater mast and browse production, and greater proximity to Memorial Lake.

None of the proposed site areas have been identified as significant habitat for any federally listed threatened or endangered species. The attached letter from Mr. Rick McWhite documents results of a site visit by the U. S. Fish and Wildlife Service, in which the site was declared not to be significant habitat.

ATTACHMENT I

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 3200TH SUPPORT WING (AFSC)
EGLIN AIR FORCE BASE, FLORIDA 32542-5000

REPLY TO
ATTN OF: DEMN 15 May 91

SUBJECT: Proposed Addition to Commissary

TO: DEV

1. An endangered species survey was completed on 9 May 90, concerning the addition to the Eglin AFB Commissary. Mr Jay Troxel, representing the US Fish and Wildlife Service, inspected the proposed construction sites with personnel from the Natural Resources Branch, Eglin AFB.

2. There are no endangered or threatened species present on or near the construction site. The nearest red-cockaded woodpecker (RCW) colony site is located one-half mile northwest of the commissary. The habitat surrounding the commissary is of poor quality, and is not considered suitable for RCW foraging and nesting.

3. The Natural Resources Branch has determined the proposed construction will have no impact on federally listed species. This determination has been verbally concurred with by the US Fish and Wildlife Service, which is the standard procedure for Air Force actions involving informal Section 7 consultations.

4. In my opinion (as a biologist with over 5 years experience in wetland science with the US Army Corps of Engineers) the isolated wetland adjacent to the new commissary will be degraded by construction activities and building location. Creation of a wetland to the southeast in the old borrow area would be the preferred alternative since quality of the existing wetland, even before construction, can probably be improved by relocating the wetland area to the southeast or northeast in wooded areas. Wildlife would benefit if this small isolated wetland was relocated to a more forested, less urban environment.

5. If you have any further questions, please contact me at 882-4164.

Richard W. McWhite

RICHARD W. MCWHITE
Chief, Natural Resources Branch
Directorate of Civil Engineering

APPENDIX VII

Eglin AFB AICUZ

THE EGLIN AFB AICUZ

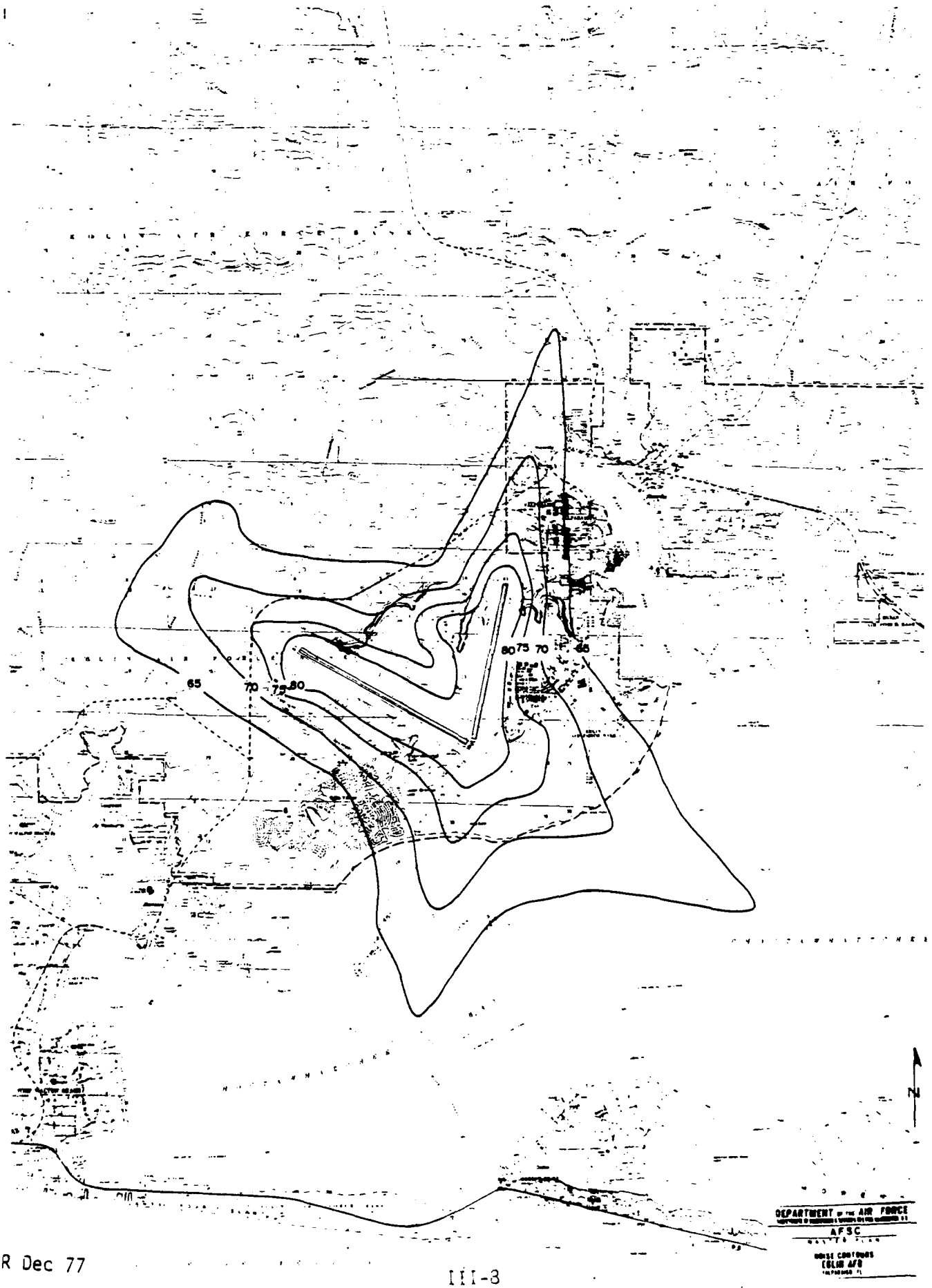
THE AREA

The Eglin AFB AICUZ (Page IV-2) and land-use guidelines (Page IV-5) are similar to other land use determinants. Like any other factor in the planning process, the AICUZ depicts the relationship between a land-use determinant and land use. In this case it is the relationship of aircraft operations to land use. The recommended AICUZ land-use guidelines are considered suitable for incorporation into the local planning process.

The boundaries of a compatible use area (i.e., an AICUZ) for an airfield are dependent upon many factors affecting the public health, safety and welfare (as discussed in Chapter III). Because land use planning must be comprehensive, it must embrace all areas affected by a given determinant.

One set of land use guidelines within a large compatible use area would be impractical and unreasonable. Recognizing this fact, it is necessary to identify areas which adequately reflect the combined effects of noise, flight tracks, altitudes and accident potential. The term Compatible Use District (CUD) has been given to these areas within an AICUZ. In effect, a CUD is an area which possesses a distinct range of noise levels and specific accident potential. It is the "building block" for compatible land use. There are thirteen basic CUD's and two supplemental CUD's at bases where noise exposure is limited. There are 12 (*) CUD's which apply to the Eglin AFB AICUZ:

CUD 1	Ldn 85+
*CUD 2	APZ I and Ldn 80-85
*CUD 3	APZ I and Ldn 75-80
*CUD 4	APZ I and Ldn 70-75
*CUD 5	APZ I and Ldn 65-70
CUD 5a	APZ I
*CUD 6	Ldn 80-85
*CUD 7	Ldn 75-80
CUD 8	APZ II and Ldn 80-85
*CUD 9	APZ II and Ldn 75-80
*CUD 10	APZ II and Ldn 70-75
*CUD 11	APZ II and Ldn 65-70
*CUD 11a	APZ II
*CUD 12	Ldn 70-75
*CUD 13	Ldn 65-70


65
70
75
80
80
75
70
65
N
DEPARTMENT OF THE AIR FORCE
AFSC
NOISE CONTOURS
EGLIN AFB

R Dec 77

Land use guidelines for each Compatible Use District are shown on Page IV-5. These guidelines have been established on the basis of studies prepared or sponsored by several federal agencies, including the Department of Housing and Urban Development, the Environmental Protection Agency, and the U.S. Air Force, plus state and local agencies. Because the types of land uses specified for each CUD are generalized (i.e., Standard Land Use Classification), there may be specific uses that are appropriate even though the general use category is not, and vice versa. Consequently, the table is only a guide and must be adapted to local conditions on a case-by-case basis. In the following section, existing and future land use compatibility determined through the application of these guidelines, is discussed.

Land use planning and control is a dynamic rather than a "static" process. The specific characteristics of land use determinants will always reflect, to some degree, the changing conditions of the economic, social and physical environment of a community as well as changing public concern. The planning process accommodates this fluidity in that decisions are normally not based on rigid boundary lines but rather on more generalized area designations.

AICUZ boundaries/noise contours describe the impact of a specific operational environment and as such will change if a significant change is made to the Eglin AFB operation. If the local community attempts to use AICUZ boundaries as the boundary lines of zoning districts, it is conceivable that problems will result. Such an attempt to solidify noise contour lines is not consistent with the above characteristics of planning. Additionally, the Air Force is recommending that AICUZ data be utilized with all other planning data. Specific land use control decisions will not, therefore, be based solely on AICUZ boundaries. The Air Force cannot guarantee that AICUZ boundaries (noise contours) will never change. It is reasonable to assume that any significant operational change (which would substantially modify the contours), would be subject to the Environmental Impact Statement requirement and thus be part of the continuing planning process.

EXISTING AND FUTURE CONDITIONS WITHIN THE EGLIN AFB AICUZ

There are two basic types of land-use problems in the vicinity of airfields - existing and possible. Most Air Force bases are located such that development has not yet occurred to the degree that there is a substantial current problem. The privately owned area within the Eglin Air Force Base AICUZ has not yet developed to the extent that a major conflict with Eglin's operation of Runway 01/19 exists. Aside from

the existing development at the approach to Runway 19, the major concern is the content of existing zoning ordinances, comprehensive plans, and proposed development. As is often the case, the areas around a military installation will develop with a suburban character. This realization (evident by what exists today), coupled with the completion of the four lane extension of State Highway 85 (in progress) and a recent proposal to open a secondary road to alleviate the congestion of traffic will undoubtedly encourage further residential development.

Recent examination of the undeveloped land within the northern most limits of Valparaiso, Florida, by the Northwest Florida Regional Planning Council, which is presently developing a Comprehensive Plan for that city, has shown that residential housing is the primary local need which might be economically supported by this land. As much of the land in question lies directly in the final approach to Eglin AFB (CUD 3 and 4), residential development of this land is considered incompatible with aircraft operations. Residential development is strongly discouraged in CUD's 10 and 12 and discouraged in CUD's 11 and 13. Special care should be given to the planning and development of this area in terms of the health, safety and welfare of potential land users, as well as the impact on the Eglin AFB mission.

In summary, the development of land in the privately owned portions of the Eglin AFB AICUZ should be carefully reviewed by the appropriate planning agencies to determine the full impact of such development prior to the final land use recommendations or approvals. Compatible use of land in these areas of the AICUZ can be insured provided the guidelines of this report are formulated into the development plans of the area. The municipalities and the governments in the area have recognized the problems that are posed by random development without orderly and uniform input to land use legislation and attendant ordinances. In view of the cooperative relations between Eglin AFB and its neighboring communities there is every reason to believe these inputs will be given appropriate consideration.

SLUCM* CODE	LAND USE CATEGORY	COMPATIBLE USE DISTRICTS												
		1	2	3	4	5*	6	7	8	9	10	11*	12	13
		Ldn 85	APZ I Ldn 80-85	APZ I Ldn 75-80	APZ I Ldn 70-75	APZ I Ldn 65-70	Ldn 80-85	Ldn 75-80	APZ II Ldn 80-85	APZ II Ldn 75-80	APZ II Ldn 70-75	APZ II Ldn 65-70	Ldn 70-75	Ldn 65-70
	RESIDENTIAL													
11x	Single Family	N	N	N	N	N	N	N	N	N	30[1,2]	25[1,2]	30[2]	25[2]
11x	Two Family	N	N	N	N	N	N	N	N	N	N	N	30[2]	25[2]
11x	Multi-family dwelling	N	N	N	N	N	N	N	N	N	N	N	30[2]	25[2]
12	Group quarters	N	N	N	N	N	N	N	N	N	N	N	30[2]	25[2]
13	Residential hotels	N	N	N	N	N	N	N	N	N	N	N	30[2]	25[2]
14	Mobile home parks or courts	N	N	N	N	N	N	N	N	N	N	N	30[2]	25[2]
15	Transient lodging - hotels, motels	N	N	N	N	N	N	N	N	N	N	N	30[2]	25[2]
19	Other residential	N	N	N	N	N	N	N	N	N	N	N	30[2]	25[2]
	INDUSTRIAL/MANUFACTURING[3]													
21	Food and kindred product	N	N	N	N	N	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
22	Textile mill products	N	N	N	N	N	Y[4]	Y[5]	N	N	N	N	Y[6]	Y
23	Apparel	N	N	N	N	N	Y[4]	Y[5]	N	N	N	N	Y[6]	Y
24	Lumber & wood products	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
25	Furniture & fixtures	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
26	Paper & allied products	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
27	Printing, publishing	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
28	Chemicals & allied products	N	Y[3,4]	Y[3,5]	Y[3,6]	Y[3]	Y[4]	Y[5]	Y[3,4]	Y[3,5]	Y[3,6]	Y[3]	Y[6]	Y
29	Petroleum refining and related industries	N	N	N	N	N	Y[4]	Y[5]	N	N	N	N	Y[6]	Y

This table is a guide. Adaptations to fit local conditions and more precise land use category designations are required based on the criteria of the foregoing narrative.

*Land Use Compatibility for CUDs 5a and 11a is the same as CUDs 5 and 11 except NLR guidelines are not applicable.

Land Use Compatibility Guidelines

SLUCM* CODE	LAND USE CATEGORY	COMPATIBLE USE DISTRICTS												
		1	2	3	4*	5	6	7	8	9	10	11*	12	13
		Ldn 85	APZ I Ldn 80-85	APZ I Ldn 75-80	APZ I Ldn 70-75	APZ I Ldn 65-70	Ldn 80-85	Ldn 75-80	APZ II Ldn 80-85	APZ II Ldn 75-80	APZ II Ldn 70-75	APZ II Ldn 65-70	Ldn 70-75	Ldn 65-70
	INDUSTRIAL/MANUFACTURING[3]													
31	Rubber & misc plastic	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
32	Stone, clay & glass products	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
33	Primary metal industries	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
34	Fabricated metal products	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
35	Professional, scientific & controlling instru	N	N	N	N	N	N	30	N	N	N	N	25	Y
39	Misc manufacturing	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
	TRANSPORTATION, COMMUNI-CATIONS & UTILITIES[7]													
41	Railroad, rapid rail transit	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
45	Highway & street ROW	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
46	Auto parking	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
47	Communications (noise sensitive)	N	N	30	25	Y	N	30	N	30	25	Y	25	Y
48	Utilities	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
42/43	Other trans, comm, & util	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

This table is a guide. Adaptations to fit local conditions and more precise land use category designations are required based on the criteria of the foregoing narrative.

*Land Use Compatibility for CUDs 5a and 11a is the same as CUDs 5 and 11 except NLR guidelines are not applicable.

Land Use Compatibility Guidelines

* SLUCM CODE	LAND USE CATEGORY	COMPATIBLE USE DISTRICTS												
		1	2	3	4*	5	6	7	8	9	10	11*	12	13
		Ldn 85	APZ I Ldn 80-85	APZ I Ldn 75-80	APZ I Ldn 70-75	APZ I Ldn 65-70	Ldn 80-85	Ldn 75-80	APZ II Ldn 80-85	APZ II Ldn 75-80	APZ II Ldn 70-75	APZ II Ldn 65-70	Ldn 70-75	Ldn 65-70
	COMMERCIAL/RETAIL TRADE													
51	Wholesale trade	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
52	Building materials-retail	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
53	General merchandise-retail	N	N	N	N	N	N	30	N	30	25	Y	25	Y
54	Food-retail	N	N	N	N	N	N	30	N	30	25	Y	25	Y
55	Automotive, marine	N	N	30	25	Y	N	30	N	30	25	Y	25	Y
56	Apparel & accessories - retail	N	N	N	N	N	N	30	N	30	25	Y	25	Y
57	Eating & drinking places	N	N	N	N	N	N	30	N	N	N	N	25	Y
58	Furniture, home furnishing retail	N	N	30	25	Y	N	30	N	30	25	Y	25	Y
59	Other retail trade	N	N	N	N	N	N	30	N	30	25	Y	25	Y
	PERSONAL & BUSINESS[8] SERVICES													
61	Finance, insurance & real estate[8]	N	N	N	N	N	N	30	N	30	25	Y	25	Y
62	Personal services	N	N	N	N	N	N	30	N	30	25	Y	25	Y
63	Business services	N	N	N	N	N	N	30	N	30	25	Y	25	Y
64	Repair Services	N	Y[4]	Y[5]	Y[6]	Y	Y[4]	Y[5]	Y[4]	Y[5]	Y[6]	Y	Y[6]	Y
66	Contract construction services	N	N	N	N	N	N	30	N	30	25	Y	25	Y

This table is a guide. Adaptations to fit local conditions and more precise land use category designations are required based on the criteria of the foregoing narrative.

*Land Use Compatibility for CUDs 5a and 11a is the same as CUDs 5 and 11 except NLR guidelines are not applicable.

SLUCM* CODE	LAND USE CATEGORY	COMPATIBLE USE DISTRICTS												
		1	2	3	4	5*	6	7	8	9	10	11*	12	13
		Ldn 85	APZ I Ldn 80-85	APZ I Ldn 75-80	APZ I Ldn 70-75	APZ I Ldn 65-70	Ldn 80-85	Ldn 75-80	APZ II Ldn 80-85	APZ II Ldn 75-80	APZ II Ldn 70-75	APZ II Ldn 65-70	Ldn 70-75	Ldn 65-70
	PERSONAL & BUSINESS[8] SERVICES (Cont)													
	Indoor recreation services	N	N	N	N	N	N	30	N	30	25	Y	25	Y
69	Other services	N	N	N	N	N	N	30	N	30	25	Y	25	Y
	PUBLIC & QUASI PUBLIC SERVICES													
67	Government services	N	N	N	N	N	N	30	N	30[8]	25[8]	Y[8]	25	Y
68	Educational services	N	N	N	N	N	N	N	N	N	N	N	30	25
711	Cultural activities incl churches	N	N	N	N	N	N	N	N	N	N	N	30	25
651	Medical & other health services[9]	N	N	N	N	N	N	N	N	N	N	N	30	25
624	Cemeteries	Y	Y[4,10]	Y[5,10]	Y[6,10]	Y[10]	Y[4]	Y[5]	Y[4,10]	Y[5,10]	Y[6,10]	Y[10]	Y[6]	Y
69x	Non profit organization	N	N	N	N	N	N	N	N	N	N	N	30	25
	Other public and quasi-public services	N	N	N	N	N	N	N	N	N	30	25	30	25
	OUTDOOR RECREATION													
761x	Playgrounds, neighborhood parks	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y
762x	Community & regional	N	N	N	Y[11]	Y[11]	N	N	N	N	Y	Y[11]	Y[11]	Y

This table is a guide. Adaptations to fit local conditions and more precise land use category designations are required based on the criteria of the foregoing narrative.

*Land Use Compatibility for CUDs 5a and 11a is the same as CUDs 5 and 11 except NLR guidelines are not applicable.

SLUCM* CODE	LAND USE CATEGORY	COMPATIBLE USE DISTRICTS												
		1	2	3	4	5*	6	7	8	9	10	11*	12	13
		Ldn 85	APZ I Ldn 80-85	APZ I Ldn 75-80	APZ I Ldn 70-75	APZ I Ldn 65-70	Ldn 80-85	Ldn 75-80	APZ II Ldn 80-85	APZ II Ldn 75-80	APZ II Ldn 70-75	APZ II Ldn 65-70	Ldn 70-75	Ldn 65-70
	OUTDOOR RECREATION (CONT)													
712	Nature exhibits	N	N	N	N	Y	N	N	N	N	N	Y	N	Y
722	Spectator sports incl arenas	N	N	N	N	N	N	N	N	N	N	N	N	Y
741x	Golf course[12], riding stables[13]	N	N	Y[14]	Y[15]	Y	N	Y[14]	N	Y[14]	Y[15]	Y	Y[15]	Y
743/ 744	Water based recreational areas	N	N	Y[14]	Y[15]	Y	N	Y[14]	N	Y[14]	Y[15]	Y	Y[15]	Y
75	Resort & group camps	N	N	N	N	N	N	N	N	N	N	N	Y	Y
721x	Auditoriums, concert halls	N	N	N	N	N	N	N	N	N	N	N	N	Y
721x	Outdoor amphitheaters, music shells	N	N	N	N	N	N	N	N	N	N	N	N	N
	Other outdoor recreation	N	N	N	Y[11]	Y[11]	N	N	N	N	Y	Y	Y	Y
	RESOURCE PRODUCTION, EXTRACTION, & OPEN SPACE													
81	Agriculture (except live-stock)	Y[17]	Y[17]	Y[17]	Y[18]	Y[19]	Y[17]	Y[17]	Y[17]	Y[17]	Y[18]	Y[19]	Y[18]	Y[19]
815/ 817	Livestock farming, animal breeding	N	N	Y[17]	Y[18]	Y[19]	N	Y[17]	N	Y[17]	Y[18]	Y[19]	Y[18]	Y[19]
83	Forestry activities	Y[17]	Y[17]	Y[17]	Y[18]	Y[19]	Y[17]	Y[17]	Y[17]	Y[17]	Y[18]	Y[19]	Y[18]	Y[19]

This table is a guide. Adaptations to fit local conditions and more precise land use category designations are required based on the criteria of the foregoing narrative.
*Land Use Compatibility for CUDs 5a and 11a is the same as CUDs 5 and 11 except NLR guidelines are not applicable.

SLUCM* CODE	LAND USE CATEGORY	COMPATIBLE USE DISTRICTS												
		1	2	3	4	5*	6	7	8	9	10	11*	12	13
		Ldn 85	APZ I Ldn 80-85	APZ I Ldn 75-80	APZ 1 I Ldn 70-75	APZ I Ldn 65-70	Ldn 80-85	Ldn 75-80	APZ II Ldn 80-85	APZ II Ldn 75-80	APZ II Ldn 70-75	APZ II Ldn 65-70	Ldn 70-75	Ldn 65-70
	RESOURCE PRODUCTION, EXTRACTION, & OPEN SPACE (Cont)													
84	Fishing activities & related services	Y	Y[11]	Y[11]	Y[11]	Y[11]	Y	Y	Y	Y	Y	Y	Y	Y
85	Mining activities	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
91	Permanent open space	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
93	Water areas	Y	Y[11]	Y[11]	Y[11]	Y[11]	Y	Y	Y[11]	Y[11]	Y[11]	Y[11]	Y	Y

This table is a guide. Adaptations to fit local conditions and more precise land use category designations are required based on the criteria of the foregoing narrative.

*Land Use Compatibility for CUDs 5a and 11a is the same as CUDs 5 and 11 except NLR guidelines are not applicable.

NOTES

N (NO) - The land use and related structures are not compatible and should be prohibited.

Y (YES) - The land use and related structures are compatible without restriction and should be considered.

Y^X (Yes With Restrictions) - The land use and related structures are generally compatible; however, some special factors should be considered.

35, 30 or 25 - The land use is generally compatible; however, a Noise Level Reduction of 35, 30 or 25 must be incorporated into the design and construction of the structure.

35^X, 30^X or 25^X - The land use is generally compatible with NLR; however, such NLR does not necessarily solve noise difficulties and additional evaluation is warranted.

1 - Because of accident hazard potential, the residential density in these CUD's should be limited to the maximum extent possible. It is recommended that residential density not exceed one dwelling unit per acre. Such use should be permitted only following a demonstration of need to utilize this area for residential purposes.

2 - Although it is recognized that local conditions may require residential uses in these CUD's, this use is strongly discouraged in CUD's 10 and 12 and discouraged in CUD's 11 and 13. The absence of alternative development options should be determined. An evaluation, indicating that a community need for residential use would not be met if development were prohibited, should be conducted prior to construction approvals in these CUD's. Where the community determines that residential uses must be allowed, Noise Level Reductions (NLR) of at least 30 (CUD's 10 and 12) and 25 (CUD's 11 and 13) should be incorporated into building codes and/or individual approvals. Additional consideration should be given to modify the NLR levels based on peak noise levels. Such criteria will not eliminate outdoor environment noise problems and, as a result, site planning and design should include measures to minimize this impact particularly where the noise is from ground level sources.

3 - Because these uses vary considerably by locality and within a general category, particular care should be taken to evaluate and modify guidelines to fit local conditions. Among factors to be considered: labor intensity, structural coverage, explosive inflammable characteristics, size of establishment, people density, peak period (including shopper/visitors) concentrations.

4 - A NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas or where the normal noise level is low.

5 - A NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas or where the normal noise level is low.

6 - A NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas or where the normal noise level is low.

7 No structures in Clear Zone, no passenger terminals, and no major ground transmission lines in Clear Zones or APZ I.

8 - Low intensity office uses only (limited scale of concentration of such uses). Meeting places, auditoriums, etc., not recommended.

9 - Excludes hospitals.

10 - Excludes chapels.

11 - Facilities must be low intensity.

12 - Clubhouse not recommended.

13 - Concentrated rings with large classes not recommended.

14 - A NLR of 30 must be incorporated into buildings for this use.

15 - A NLR of 25 must be incorporated into buildings for this use.

16 - No structures in Clear Zone.

17 - Residential structures not permitted.

18 - Residential buildings require a NLR of 30.

19 - Residential buildings require a NLR of 25.

APPENDIX VIII

Sediment/Water Quality Data

- Woodward-Clyde Federal Services
  May 1991

- Engineering-Science
  January 1990

- Jammal & Associates, Inc.
  August 3, 1989

- Water & Air Research, Inc.
  September 1984

Surface Water Sample

May 1991
Woodward-Clyde Federal Services

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahasse, FL 32317-3056 • (904) 878-3994 • Fax (904) 878-9504

LOG NO: T1-01357

Received: 11 MAY 91

Ms. Marianne Gruber
Woodward-Clyde Federal Services, Inc.
2014-B Lewis Turner Blvd.
Ft. Walton Beach, Florida 32548

CC: Mr. Dave Connors

Project: EA Commisary/1004-100

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
01357-1	IWTLD	Client

PARAMETER	01357-1
Primary Drinking - Volatiles	
Benzene, ug/l	<0.50
Carbon Tetrachloride, ug/l	<0.50
1,4-Dichlorobenzene, ug/l	<0.50
1,2-Dichloroethane, ug/l	<0.50
1,1-Dichloroethylene, ug/l	<0.50
Tetrachloroethylene, ug/l	<0.50
1,1,1-Trichloroethane, ug/l	<0.50
Trichloroethylene, ug/l	<0.50
Vinyl Chloride, ug/l	<0.50
Trihalomethanes	
Bromoform, ug/l	<1.0
Chloroform, ug/l	<1.0
Dichlorobromomethane, ug/l	<1.0
Dibromochloromethane, ug/l	<1.0
Primary metals	
Arsenic, mg/l	<0.010
Barium, mg/l	<0.010
Cadmium, mg/l	<0.0050
Chromium, mg/l	<0.010
Lead, mg/l	<0.0050
Selenium, mg/l	<0.010
Silver, mg/l	<0.010
Mercury, mg/l	<0.00020

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahasse, FL 32317-3056 • (904) 878-3994 • Fax (904) 878-9504

LOG NO: T1-01357

Received: 11 MAY 91

Ms. Marianne Gruber
Woodward-Clyde Federal Services, Inc.
2014-B Lewis Turner Blvd.
Ft. Walton Beach, Florida 32548

CC: Mr. Dave Connors

Project: EA Commisary/1004-100

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
01357-2	IWTLD	Client

PARAMETER	01357-2
1,2-Dibromoethane (EDB), ug/l	<0.020
Pesticides (SDWA)	
Endrin, ug/l	<0.020
Gamma-BHC, ug/l	<0.010
Methoxychlor, ug/l	<0.50
Toxaphene, ug/l	<1.0
Herbicides (SDWA)	
2,4-D, ug/l	<0.50
2,4,5-TP Silvex, ug/l	<0.10
Chloride, mg/l	4.5
Color, PCU	60
Copper, mg/l	<0.025
Corrosivity (saturation index), mg/l	-2.4
Surfactants (MBAS-EPA 425.1), mg/l	1.7
Iron, mg/l	0.88
Manganese, mg/l	0.014
Odor, T.O.N	1
pH, units	6.8
Sulfate as SO4, mg/l	<5.0
Total Dissolved Solids, mg/l	53
Zinc, mg/l	<0.020
Fluoride, mg/l	<0.20

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive (32301) • P O Box 13056 • Tallahasse, FL 32317-3056 • (904) 878-3994 • Fax (904) 878-9504

LOG NO: T1-01357

Received: 11 MAY 91

Ms. Marianne Gruber
Woodward-Clyde Federal Services, Inc.
2014-B Lewis Turner Blvd.
Ft. Walton Beach, Florida 32548

CC: Mr. Dave Connors Project: EA Commisary/1004-100

REPORT OF RESULTS Page 3

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY
01357-3	Lab Blank	Client
01357-4	Accuracy (% Recovery)	
01357-5	Precision (% RPD)	

PARAMETER	01357-3	01357-4	01357-5
Primary Drinking - Volatiles			
Benzene, ug/l	<0.50	102 %	1.0 %
Carbon Tetrachloride, ug/l	<0.50	---	---
1,4-Dichlorobenzene, ug/l	<0.50	---	---
1,2-Dichloroethane, ug/l	<0.50	---	---
1,1-Dichloroethylene, ug/l	<0.50	86 %	10 %
Tetrachloroethylene, ug/l	<0.50	---	---
1,1,1-Trichloroethane, ug/l	<0.50	---	---
Trichloroethylene, ug/l	<0.50	97 %	0 %
Vinyl Chloride, ug/l	<0.50	---	---
Trihalomethanes			
Bromoform, ug/l	<1.0	---	---
Chloroform, ug/l	<1.0	---	---
Dichlorobromomethane, ug/l	<1.0	---	---
Dibromochloromethane, ug/l	<1.0	---	---
1,2-Dibromoethane (EDB), ug/l	<0.020	94 %	9.6 %
Primary metals			
Arsenic, mg/l	<0.010	120 %	7.5 %
Barium, mg/l	<0.010	97 %	6.2 %
Cadmium, mg/l	<0.0050	101 %	1.0 %
Chromium, mg/l	<0.010	92 %	1.1 %
Lead, mg/l	<0.0050	99 %	4.0 %
Selenium, mg/l	<0.010	112 %	0.89 %
Silver, mg/l	<0.010	101 %	3.0 %

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive (32301) • P O Box 13056 • Tallahasse, FL 32317-3056 • (904) 878-3994 • Fax (904) 878-9504

LOG NO: T1-01357

Received: 11 MAY 91

Ms. Marianne Gruber
Woodward-Clyde Federal Services, Inc.
2014-B Lewis Turner Blvd.
Ft. Walton Beach, Florida 32548

CC: Mr. Dave Connors

Project: EA Commisary/1004-100

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY
01357-3	Lab Blank	Client
01357-4	Accuracy (% Recovery)	
01357-5	Precision (% RPD)	

PARAMETER	01357-3	01357-4	01357-5
Mercury, mg/l	<0.00020	100 %	3.0 %
Pesticides (SDWA)			
Endrin, ug/l	<0.020	78 %	7.3 %
Gamma-BHC, ug/l	<0.010	109 %	9.0 %
Methoxychlor, ug/l	<0.50	---	---
Toxaphene, ug/l	<1.0	---	---
Herbicides (SDWA)			
2,4-D, ug/l	<0.50	40 %	4.5 %
2,4,5-TP Silvex, ug/l	<0.10	74 %	16 %
Chloride, mg/l	<1.0	101 %	0.24 %
Color, PCU	<5	---	0 %
Copper, mg/l	<0.025	92 %	5.5 %
Corrosivity (saturation index)	---	---	---
Surfactants (MBAS-EPA 425.1), mg/l	<0.10	110 %	20 %
Iron, mg/l	<0.050	90 %	5.6 %
Manganese, mg/l	<0.010	92 %	2.2 %
Odor, T.O.N	<1	---	---
pH, units	5.6	98 %	0 %
Sulfate as SO4, mg/l	<5.0	98 %	4.1 %
Total Dissolved Solids, mg/l	<5.0	100 %	1.0 %
Zinc, mg/l	<0.020	100 %	0.50 %
Fluoride, mg/l	<0.20	96 %	0 %

Method: EPA 40 CFR Part 136; 141
HRS Certification #'s:81291,87279,E81005,E87052

Thomas L. Stephens

Summary of Organic & Inorganic Analytical Data for Groundwater Samples

Analysis of Potential Human Exposure Pathways

Carcinogenic Risk

Site 14-D2 Landfill
Eglin AFB IRP Stage 3 Investigation

January 1990
Engineering-Science

TABLE 4.13.1

SUMMARY OF ORGANIC ANALYTICAL DATA FOR GROUNDWATER SAMPLES
SITE 14 - D2 LANDFILLL
EGLIN AFB IRP STAGE 3 INVESTIGATION

Method/Parameter	Units	Sample Identification			
		14-MWD2-A	14-MWD2-B	14-MWD2-C	14-MWD2-D
Date Collected		7/15/88	7/15/88	7/15/88	7/15/88
Purgeable Halocarbons (E601)					
Trichloroethylene	µg/L	--	--	0.96	0.53
Organochlorine Pesticides & PCBs (E608)					
All Parameters	--	--	--	--	
Purgeable Aromatic Hydrocarbons (SW8020)					
All Parameters	--	--	--	--	
Semivolatile Organics (E625)					
bis(2-Ethylhexyl) phthalate(*)	µg/L	--	860	--	--
Total Petroleum Hydrocarbons (E418.1)					
Hydrocarbons	mg/L	--	--	--	1

-- Not Detected.

TABLE 4.13.2

SUMMARY OF INORGANIC ANALYTICAL DATA FOR GROUNDWATER SAMPLES
SITE 14 - D2 LANDFILL
EGLIN AFB IRP STAGE 3 INVESTIGATION

Parameter	Analytical Method	Units	Sample Identification: 14-MWD2-A Total	14-MWD2-A Dissolved	14-MWD2-B Total	14-MWD2-B Dissolved	14-MWD2-C Total	14-MWD2-C Dissolved	14-MWD2-D Total	14-MWD2-D Dissolved
Date Collected			7/15/88	7/15/88	7/15/88	7/15/88	7/15/88	7/15/88	7/15/88	7/15/88
Specific Conductance	E120.1	umhos/cm	300	NA	250	NA	220	NA	37	NA
pH	E150.1	S.U.	5.1	NA	6.4	NA	6.1	NA	5.8	NA
Total Dissolved Solids	E160.1	mg/L	38	NA	160	NA	170	NA	33	NA
Metals Screen	E200.7	mg/L								
Aluminum			46	0.18	8.7	0.052	9.7	0.076	4.3	0.10
Barium			0.03	--	0.02	0.010	0.03	--	0.01	--
Boron			0.02	--	0.05	--	0.08	--	0.02	--
Calcium			0.90	0.81	39	34	39	34	0.45	0.47
Chromium			0.05	--	0.02	--	0.01	--	0.01	
Cobalt			0.02	--	--	--	--	--	--	--
Copper			0.04	--	0.02	--	0.01	--	--	--
Iron			33	0.074	15	4.1	8.4	0.048	6.9	2.5
Magnesium			1.4	0.49	3.4	3.6	2.1	1.7	0.70	0.50
Manganese			0.05	--	0.64	0.43	0.07	0.026	0.09	0.094
Potassium			0.91	0.30	1.4	1.5	2.1	1.5	0.64	0.16
Silica			36	1.5	16	4.9	21	5.3	6.9	2.3
Sodium			2.4	2.5	2.4	2.7	3.9	4.1	3.3	3.6
Vanadium			0.05	--	--	--	0.02	--	--	--
Zinc			0.26	0.019	0.18	--	0.20	--	0.19	--
Arsenic	E206.2	mg/L	0.018	--	--	--	--	--	--	--
Lead	E239.2	mg/L	0.010	--	--	--	--	--	--	--
Mercury	E245.1	mg/L	--	NA	--	NA	--	NA	--	NA
Selenium	E270.2	mg/L	--	--	--	--	--	--	--	--
Total Alkalinity	A403	mg/L	10	NA	106	NA	42	NA	73	NA
Common Ions	A429	mg/L		NA		NA		NA		NA
Chloride			3.1	NA	3.7	NA	5.3	NA	4.8	NA
Fluoride			--	NA	--	NA	0.7	NA	--	NA
Nitrate			--	NA	--	NA	2.8	NA	--	NA
Sulfate			3.7	NA	18	NA	27	NA	2.9	NA

-- Not Detected
NA Not Analyzed

TABLE 4.13.3

ANALYSIS OF POTENTIAL HUMAN EXPOSURE PATHWAYS
SITE 14 - D2 LANDFILL
EGLIN AFB IRP STAGE 3 INVESTIGATION

Transport Medium	Sources/Release Mechanism	Potential Exposure Point(s)	Potential Receptor(s)	Primary Route(s) of Exposure	Probability of Pathway Completion
Current Pathways					
Air	Contaminated Soils, buried waste/volatilization	Site 14; points downwind	Base personnel, visitors, nearby residents	inhalation	None: volatile soil contamination was not identified.
	Contaminated soils/fugitive dust generation	Site 14; points downwind	as above	inhalation	None: site is covered by several feet of soil
Surface water/ sediments	Contaminated soils, groundwater/runoff, groundwater seepage	Pond between Site and Base exchange	Base personnel, visitors, nearby residents	oral, dermal	Very low-none: Pond is not used recreationally; Contamination was not identified
Soils	Contaminated soils, buried waste/leaching, tracking fugitive dust generation	Site 14	Base personnel, visitors, nearby residents	oral, dermal	Very low-none: Contact is precluded by the fact that the site is covered by several feet of local soils; no soil contamination was identified
Groundwater	Buried Waste, contaminated soils/site leaching	downgradients wells in the shallow aquifer	base personnel, nearby residents	oral, dermal inhalation	None: there are no wells in the shallow aquifer downgradient of the site.
Hypothetical Future Pathways					
Soils	Contaminated soils, buried waste/leaching, tracking fugitive dust generation	Site 14	future workers, residents	oral, dermal	None - low: If excavation activities occur at the site or if the site is developed as a residential area, exposure could occur. However, no soil contamination has been detected.
Groundwater	Buried waste, contaminated soils/site leaching	downgradient wells in the shallow aquifer	future workers, residents	oral, dermal, inhalation	Moderate. In the unlikely event that the shallow aquifer were developed as a drinking water source, exposure could occur.

TABLE 4.13.4

CARCINOGENIC RISK
SITE 14 - D2 LANDFILL
EGLIN AFB IRP STAGE 3 INVESTIGATION

Receptor/Indicator Chemical	Carcinogenic Potnecy Factor 1/(mg/kg/day) Oral	Inhal.	Oral Risk Average	Maximum	Inhalation Risk Average	Maximum
Residents						
trichloroethylene	1.10E-02	1.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Total Route-Specific Risk		0.00E+00	0.00+E00	0.00E+00	0.00E+00
					Total Average Risk =	0.00E+00
					Total Maximum Risk =	0.00E+00
Workers						
trichloroethylene	1.10E-02	1.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Total Route-Specific Risk		0.00E+00	0.00E+00	0.00E+00	0.00E+00
					Total Average Risk =	0.00E+00
					Total Maximum Risk =	0.00E+00
Hypothetical Future Workers						
trichloroethylene	1.10E-02	1.30E-02	7.17E-08	9.24E-08	0.00E+00	0.00E+00
	Total Route-Specific Risk		7.17E-08	9.24E-08	0.00E+00	0.00E+00
					Total Average Risk =	7.17E-08
					Total Maximum Risk =	9.24E-08
Hypothetical Future Residents						
trichloroethylene	1.10E-02	1.30E-02	2.84E-07	3.66-07	5.04E-07	6.50E-07
	Total Route-Specific Risk		2.84E-07	3.66E-07	5.04E-07	6.50E-07
					Total Average Risk =	7.88E-07
					Total Maximum Risk =	1.02E-06

Groundwater Results for Monitoring Wells MW-1 and MW-2

Environmental Conditions Study

August 3, 1989

Jammal & Associates, Inc.

ENVIRONMENTAL CONDITIONS STUDY PROPOSED COMMISSARY ADDITION EGLIN AIR FORCE BASE, PENSACOLA, FLORIDA

JAMMAL & ASSOCIATES, INC. Consulting Engineers

MEMBER

Associated Soil and Foundation Engineers, Inc.
American Consulting Engineers Council
National Society of Professional Engineers
Florida Institute of Consulting Engineers
American Society for Testing and Materials
American Concrete Institute

5925 Benjamin Center Drive, Suite 116, Tampa, Florida 33634 ■ *Telephone (813) 886-1075*

the presence of combustible vapors (methane, hydrocarbons) in the shallow soils. The analyses were performed utilizing a Heath Consultants Porta-FID II flame ionization detector. In all borings tested the concentrations of combustible vapors were nominal ranging from 0-14 parts per million (ppm), well below the FDER designated standard of 500 ppm for excessively contaminated soil.

Groundwater Levels

The water table was found from about 2 to 7 feet below grade in the borings after a short stabilization period, and was apparently dependent upon the ground elevation at the boring locations, as would be expected. Fluctuations in the groundwater level are expected with rainfall patterns, post construction influences such as new retention area construction and low area filling, and other factors.

Monitor Well Siting

In order to assess groundwater quality conditions underlying the project site with respect to impact from historic landfilling, two (2) locations east of the project site were selected. At these locations 2" diameter PVC monitor wells were installed to a depth of 15 feet. These wells are configured as indicated on Plate 1 and are located as portrayed on Sheet 1.

Groundwater Sampling and Analysis

Groundwater samples were obtained from the wells on July 13, 1989, according to procedures and methodology detailed in Jammal & Associates, Inc. FDER approved Generic Quality Assurance Plan.

The samples were transported to PACE laboratories for analysis for:

* FAC 17-550 Primary Drinking Water Standard Metals
* FAC 17-550 Secondary Drinking Water Standards
* FAC 17-550 Primary Drinking Water Standard Pesticides and Herbicides

These parameters were selected to be generally indicative of groundwater contamination related to historic landfilling activities.

GROUNDWATER ANALYSIS RESULTS

The complete laboratory test reports are presented in the Appendix. Examination of this data indicates that several metallic compounds were identified at concentrations in excess of the Primary Drinking Water Standards, tabulated as follows:

PARAMETER	LOCATION	CONCENTRATION* REPORTED	MCL**
Chromium	MW-1	0.16	0.05
	MW-2	0.08	
Lead	MW-1	0.115	0.05
	MW-2	0.075	

* All values in parts per million (milligrams per liter)
** MCL = Maximum Contaminant Level

Additionally, iron, manganese, and other parameters in excess of Secondary Drinking Water Standards were detected at both monitor well locations. The metallics documented in these analyses are frequently related to landfilling of domestic wastes and are nominally in excess of regulatory standards. Since the facility is to be served by a potable water system, these concentrations are not thought to pose a threat to human health.

Jammal & Associates, Inc. appreciates the opportunity of providing professional services on this project. If you have any questions, please do not hesitate to call.

Sincerely,

JAMMAL & ASSOCIATES, INC.

Everett J. Ferris
Hydrogeologist

Stephen J. Haverl, P.G.
Geoenvironmental Services Manager

EJF/SJH/kms
0103h

pace laboratories, inc

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California
Leawood, Kansas

August 02, 1989

Mr. Jay Ferris
Jammal & Associates
5925 Benjamin Center Drive
Tampa, FL 33634

Dear Mr. Ferris:

Enclosed is the report of laboratory analyses for samples received 07/14/89.

If you have any questions concerning this report, please feel free to contact us.

Sincerely,

Steven G. Packard
Assistant Director, Analytical Services

Enclosures

pace laboratories, inc

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California
Leawood, Kansas

Jammal & Associates
5925 Benjamin Center Drive
Tampa, FL 33634

August 02, 1989
PACE Project Number: 290710520

Attn: Mr. Jay Ferris

1570

Date Sample(s) Collected: 07/13/89
Date Sample(s) Received: 07/14/89

PACE Sample Number: / Parameter	Units	MDL	565040 MW-1	565050 MW-2
INORGANIC ANALYSIS				
PRIMARY DRINKING WATER PARAMETERS				
Arsenic	ug/L	10	20	17
Barium	mg/L	0.3	ND	ND
Cadmium	mg/L	0.01	ND	ND
Chromium	mg/L	0.05	0.16	0.08
Lead	ug/L	5	115	75
Mercury	ug/L	0.2	0.7	0.7
Selenium	ug/L	10	ND	ND
Silver	mg/L	0.02	ND	ND
Nitrogen, Nitrate	mg/L	1	ND	ND
Sodium	mg/L	1	4	3
Fluoride, soluble	mg/L	0.05	ND	ND
SECONDARY DRINKING WATER PARAMETERS				
Chloride	mg/L	1	6	5
Color	Units	5	15	100
Copper	mg/L	0.05	0.08	0.06
Corrosivity	Units		-3.0	-3.6
Surfactants	mg/L	0.05	ND	ND
Iron	mg/L	0.3	55	60
Manganese	mg/L	0.05	0.38	0.38
Odor	Ton	1	ND	ND
pH	SU	-	5.9	5.7
Sulfate, as SO4	mg/L	5	6	6
Solids, Total Dissolved	mg/L	5	38	72
Zinc	mg/L	0.02	0.20	0.19
Turbidity	NTU	1	1400	1700

MDL Method Detection Limit
ND Not detected at or above the MDL.

pace laboratories, inc.

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California
Leawood, Kansas

August 02, 1989
PACE Project Number: 290710520

PACE Sample Number: / Parameter	Units	MDL	565040 MW-1	565050 MW-2
ORGANIC ANALYSIS				
SDWA ORGANICS (PESTICIDES/HERBICIDES)				
g-BHC	ug/L	0.05	ND	ND
Endrin	ug/L	0.05	ND	ND
Methoxychlor	ug/L	100	ND	ND
Toxaphene	ug/L	1.0	ND	ND
2,4-D	ug/L	1	ND	ND
Silvex	ug/L	1	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.

Steven G. Packard
Assistant Director, Analytical Services

Michael W. Palmer
Organic Chemistry Manager

Analytical Results for Groundwater, Surface Water and Sediment samples from the Vicinity of the D-2 Landfill

Eglin IRP Phase II Stage I

September 1984

Water & Air Research, Inc.

Table 6. Results of Analyses of Samples Collected in the Vicinity of Landfill D-2, November 1982

Parameter	Groundwater A	Groundwater B	Groundwater C	Groundwater D	Surface Water E	Sediment E
pH	4.9	5.4	6.0	5.7	5.8	NA
Specific conductance (umhos/cm)	27	168	137	31	53	NA
TOC (mg/l)	151	179	31	19	18	NA
TOX (mg Cl^-/l)	<0.05	<0.05	0.06	0.09	<0.05	NA
Oil and grease (mg/l)	<5	<5	<5	<5	8	<200†
Phenolics (ug/l)	<1	4	<1	<1	11	NA
Arsenic (ug/l)	111	225	<10	<10	<10	NA
Cadmium (ug/l)	2	1	2	1	16	NA
Chromium (ug/l)	64	90	29	<10	<10	NA
Cobalt (ug/l)	25	60	<10	<10	<10	NA
Lead (ug/l)	<25	25	<25	<25	42	NA
Mercury (ug/l)	<2	<2	<2	<2	<2	NA
Nickel (ug/l)	55	71	28	<10	33	NA
Silver (ug/l)	<1	<1	<1	<1	<1	NA
Zinc (mg/l)	0.08	0.08	0.05	0.03	0.10	NA
Organochlorine pesticides (ug/l)	ND	ND	ND	ND	DDT*	DDT*
PCBs (ug/l)	ND	ND	ND	ND	ND	ND
2,4-D (ug/l)	<3	<3	<3	<3	<3	ND
2,4,5-T (ug/l)	<3	<3	<3	<3	<3	ND
Silvex (ug/l)	<3	<3	<3	<3	Trace	ND
Purgeable organics (ug/l)	<10	<10	<10	<10	<10	NA

NOTES: NA = not analyzed.
ND = none detected.
Trace = peak detected, but less than stated detection limit.

*See Table 18 for specific parameters and concentrations found.
†Oil and grease values for sediments are in mg/kg dry weight.

Table 7. Results of Analyses of Samples Collected in the Vicinity of Landfill D-2, February '983

Parameter	Groundwater A	Groundwater B	Groundwater C	Groundwater D	Surface Water E	Sediment E
pH	5.3	5.3	5.5	5.5	5.8	NA
Specific conductance (umhos/cm)	35	105	139	27	48	NA
DOC (mg/l)*	12	12	15	15	17	NA
TOX (mg Cl^-/l)	<0.05	<0.05	<0.05	<0.05	<0.05	NA
Oil and grease (mg/l)	<5	<5	<5	<5	<5	<200†
Phenolics (ug/l)	<1	<1	<1	2	1	NA
Arsenic (ug/l)	<2	<2	<2	<2	<2	NA
Cadmium (ug/l)	<0.2	0.5	<0.2	0.4	0.6	NA
Chromium (ug/l)	<2	<2	<2	<2	<2	NA
Cobalt (ug/l)	<5	<5	<5	<5	<5	NA
Lead (ug/l)	<5	<5	<5	<5	<5	NA
Mercury (ug/l)	<0.2	0.3	<0.2	<0.2	<0.2	NA
Nickel (ug/l)	<2	<2	<2	<2	<2	NA
Silver (ug/l)	2.5	<0.5	0.6	<0.5	<0.5	NA
Zinc (mg/l)	<0.01	<0.01	0.02	<0.01	0.02	NA
Organochlorine pesticides (ug/l)	ND	ND	ND	ND	ND	ND
PCBs (ug/l)	ND	ND	ND	ND	ND	ND
2,4-D (ug/l)	<3	<3	<3	<3	<3	ND
2,4,5-T (ug/l)	<3	<3	<3	<3	<3	ND
Silvex (ug/l)	<3	<3	<3	<3	<3	ND
Purgeable organics* (ug/l)	<10	<10	<10	<10	<10	NA

NOTES: NA = not analyzed.
DOC = dissolved total organic carbon.
ND = none detected.
All metals values for February sampling trip are for the dissolved (<0.45 um) fraction.

*Holding time was exceeded.
†Oil and grease values for sediments are in mg/kg dry weight.

APPENDIX IX

Endangered Species Survey

Natural Resources Branch
Letter dated 15 May 1991

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 3200TH SUPPORT WING (AFSC)
EGLIN AIR FORCE BASE, FLORIDA 32542-5000

REPLY TO
ATTN OF: DEMN

15 May 91

SUBJECT: Proposed Addition to Commissary

TO: DEV

1. An endangered species survey was completed on 9 May 90, concerning the addition to the Eglin AFB Commissary. Mr Jay Troxel, representing the US Fish and Wildlife Service, inspected the proposed construction sites with personnel from the Natural Resources Branch, Eglin AFB.

2. There are no endangered or threatened species present on or near the construction site. The nearest red-cockaded woodpecker (RCW) colony site is located one-half mile northwest of the commissary. The habitat surrounding the commissary is of poor quality, and is not considered suitable for RCW foraging and nesting.

3. The Natural Resources Branch has determined the proposed construction will have no impact on federally listed species. This determination has been verbally concurred with by the US Fish and Wildlife Service, which is the standard procedure for Air Force actions involving informal Section 7 consultations.

4. In my opinion (as a biologist with over 5 years experience in wetland science with the US Army Corps of Engineers) the isolated wetland adjacent to the new commissary will be degraded by construction activities and building location. Creation of a wetland to the southeast in the old borrow area would be the preferred alternative since quality of the existing wetland, even before construction, can probably be improved by relocating the wetland area to the southeast or northeast in wooded areas. Wildlife would benefit if this small isolated wetland was relocated to a more forested, less urban environment.

5. If you have any further questions, please contact me at 882-4164.

Richard W. McWhite

RICHARD W. MCWHITE
Chief, Natural Resources Branch
Directorate of Civil Engineering

APPENDIX X

Cultural Resources Survey

New World Research
May 1991

CULTURAL RESOURCES SURVEY
EGLIN COMMISSARY ADDITION
EGLIN AIR FORCE BASE, FLORIDA

By
L. Janice Campbell

For
Woodward-Clyde Federal Services
Fort Walton Beach, Florida

New World Research, Inc.
Report of Investigations No. 201

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER ONE
PROJECT OVERVIEW

Introduction

In May, 1991, Woodward-Clyde (Woodward-Clyde) Federal Services retained with New World Research, Inc. (NWR) to conduct a cultural resources survey of the proposed commissary addition at Eglin Air Force Base (Eglin), Florida (Figure 1). The work was coordinated through Richard Hartman, representing Woodward-Clyde, with the Eglin Environmental Office, represented by Jesse Borthwick.

The survey was conducted by a two-person crew over a two day period. Despite a thorough inspection of the area, there was no evidence of prehistoric remains and all historic materials represented recent discard. This report documents the field procedures and findings. Brief sections on the physical setting and culture sequence are also included. NWR recently completed a comprehensive Technical Synthesis. That volume contains an extensive discussion of the environment and reconstruction of culture history, derived from eight years of work; the reader is referred to the synthesis for more detail on these areas of concern (*Thomas and Campbell 1990*)

General Setting

Eglin is situated on the Florida panhandle in portions of Okaloosa, Santa Rosa and Walton Counties. Air Force-owned property includes a variety of settings from interior uplands to coastal zones. Major bodies of water include the Gulf of Mexico, Choctawhatchee Bay and East Bay.

Physiographically, Eglin is within the Coastal Plains Province which in turn is comprised of two divisions: the Western Highlands and the Gulf Coastal Lowlands. The division is a direct result of the higher sea levels of the past; ancient seas eroded into the Citronelle highlands (Western Highlands) and produced the Coastal Plains. The Western Highlands slope to the south in a subtle fashion. As sea level dropped in an episodic manner, it produced the Gulf Coastal Lowlands, a landscape generally less than 30m above mean sea level (amsl). The zone

generally encompasses only the shoreward 16km and is characterized by a relatively undissected surface. In essence, a north-south transect cutting through the project area takes one from modern, quartz sand beaches through a series of often poorly differentiated, sandy marine terrace deposits of Quaternary age, to a thick sequence of sands containing lenses of fine gravel and clay.

The area is characterized by a warm, humid, temperate climate (*U.S. Dept. of Commerce 1972*). Precipitation occurs mostly as rain with annual totals approximating 1,650mm; very little of the precipitation occurs as snow, hail or fog drip. Average annual temperature is about 19°C, because the Gulf has an attenuating effect on the potentially hot summers and cool winters. Average summer temperature is approximately 27°C, whereas winter is approximately 12°C.

Hurricanes have a major climatological and geomorphological impact on the Gulf Coast (e.g., *Simpson and Riehl 1981; Basillie 1986*). Tropical storms moving along the Gulf Coast have been documented since 1872 (*U.S. Army Corps of Engineers 1986*). Between 35 and 45 tropical storms, many reaching hurricane strength, have moved across the area during this period. Hurricane Frederick, in 1979, was the most recent major storm to strike the coast and affect the area. In the years since, two hurricanes, Elena and Juan (both in 1985), have left recognizable, but less notable marks on the landscape.

The potential for site recognition is a function of: 1) human preference for specific geomorphic situations, and 2) the stability of land surfaces. Human preferences largely relate to water availability. Perennially flowing freshwater sources are clearly an inducement to cultural activity, as exemplified by a single profile across the Yellow River bottomlands and adjacent valley footslope. Sites on the uplands that might be potential areas for aboriginal activity would be found in locations where there are seeps, pitcher plant bogs, steepheads and benches or relatively level areas adjacent to perennial streams. Water availability along the coast is also very good where small streams enter the Gulf, thereby providing a ready source of freshwater. Some locations which do have water would likely not have experienced long-term, continuous aboriginal activity (post-7500 B.P.), since they are too wet and inaccessible (i.e., there is no well-drained area conveniently adjacent to the water source for occupants to utilize). Such an area, for example, would be much of the Titi Creek bottom.

In addition to water availability, human preference would also, of course, include food availability: 1) game, 2) fish (freshwater varieties such as catfish and saltwater species), 3) other marine life such as clams and oysters, and 4) locations of fertile soils where one might utilize cultivars such as maize and beans. There are, however, no outstanding sites for agriculture in the area, and the best sites, at least those with the greatest potential, are few and with small areal extent. Most of the best soils in the region are found north of the area.

Seventy-eight percent of the area is comprised of Lakeland sand, which is the poorest soil in the area from an agricultural standpoint. Soils which might be of limited agricultural use would include the Rutlege soil found in small stream bottoms, the Pactolus loamy sand found in low areas on the uplands, the Johns fine sandy loam located on stream terraces and, finally, the Troup and Chipley soils which are marginal and located on uplands and upland slopes.

Variation in the vegetation of the area is a reflection of the variation in topography, soil and fire history. Because the forest in the area is within a military reserve, it retains more of the native forest qualities than is typical of the managed forests of the region. The current upland vegetation is dominated by longleaf pine (*Pinus palustris*) and turkey oak (*Quercus laevis*). Other oaks and pines in the uplands include blue jack oak (*Quercus incana*), scrubby post oak (*Q. margaretta*), live oak (*Q. virginia*), laurel oak (*Q. laurifolia*), sand pine (*Pinus clausa*) and loblolly pine (*P. taeda*).

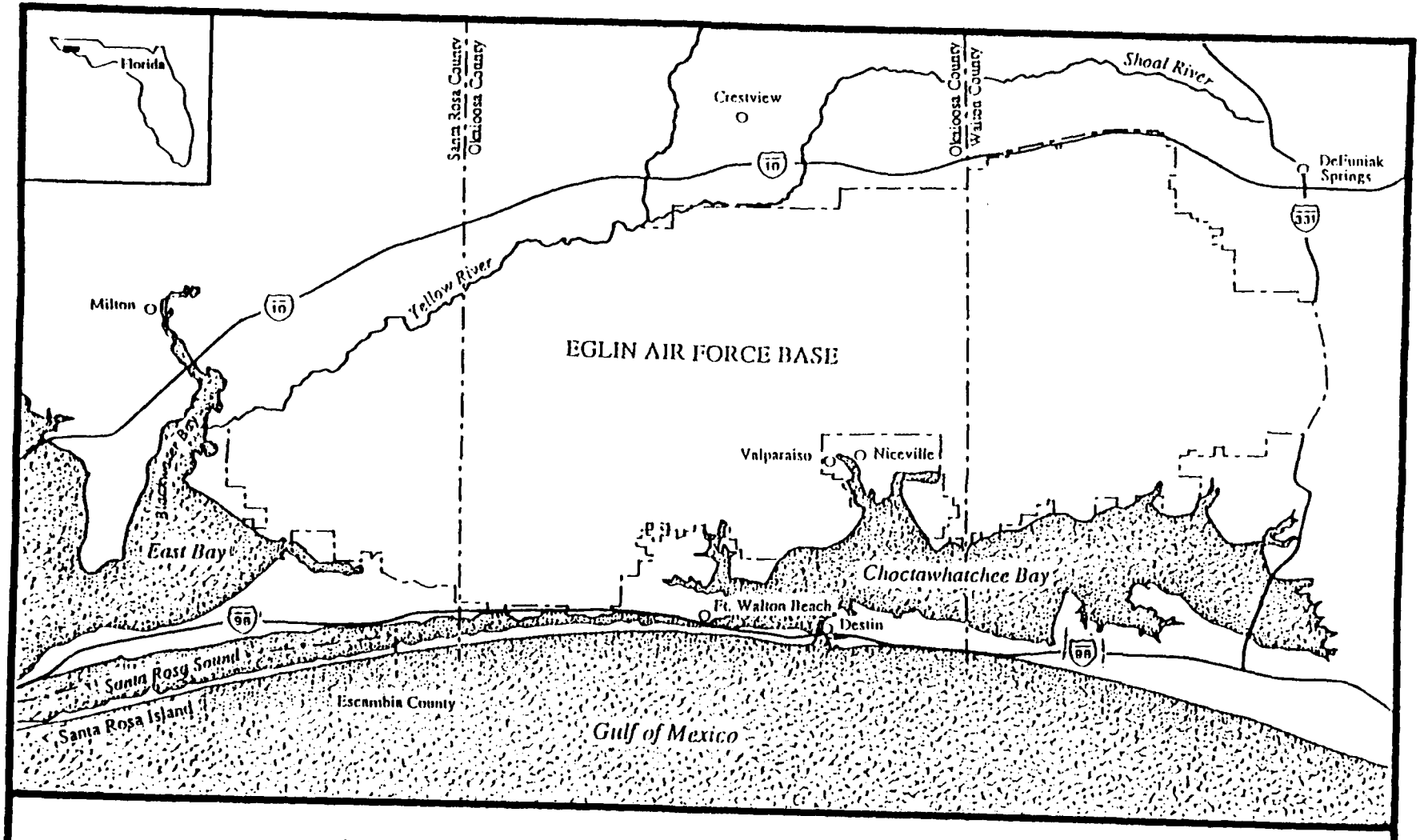


Figure 1. General Map of Eglin Air Force Base Showing Boundaries in Relation to Local Towns and Bodies of Water

Other trees and shrubs in these sandy uplands include sandhill haw (*Crataegus lacrimata*), persimmon (*Diospyros virginiana*), southern magnolia (*Magnolia grandiflora*), dwarf huckleberry (*Gaylussacia mosieri*), sparkleberry tree (*Vaccinium arboreum*) and yaupon (*Ilex vomitoria*). On well-drained sites, such as dune remnants, where the loose sands are thickest, xeric-adapted and fire-resistant oaks appear to be more abundant.

Proposed Commissary Addition Area

Eglin plans to expand the commissary, located in Okaloosa County between Memorial Trail and Eglin Boulevard (Figure 2). Memorial Lake and Lower Memorial Lake border the survey area on the southern and western sides. Vegetation varies at the site with some portions covered in mixed hardwood and pine and others with very little vegetation. Disturbance was evident in large portions of the proposed impact area.

Report Organization

Chapter Two presents a brief review of the culture history of the Eglin area. Again, the information is extracted from the Eglin Technical Synthesis (*Thomas and Campbell 1990*). A description of the field methods and findings is presented in Chapter Three, along with recommendations. A bibliography of references cited follows.

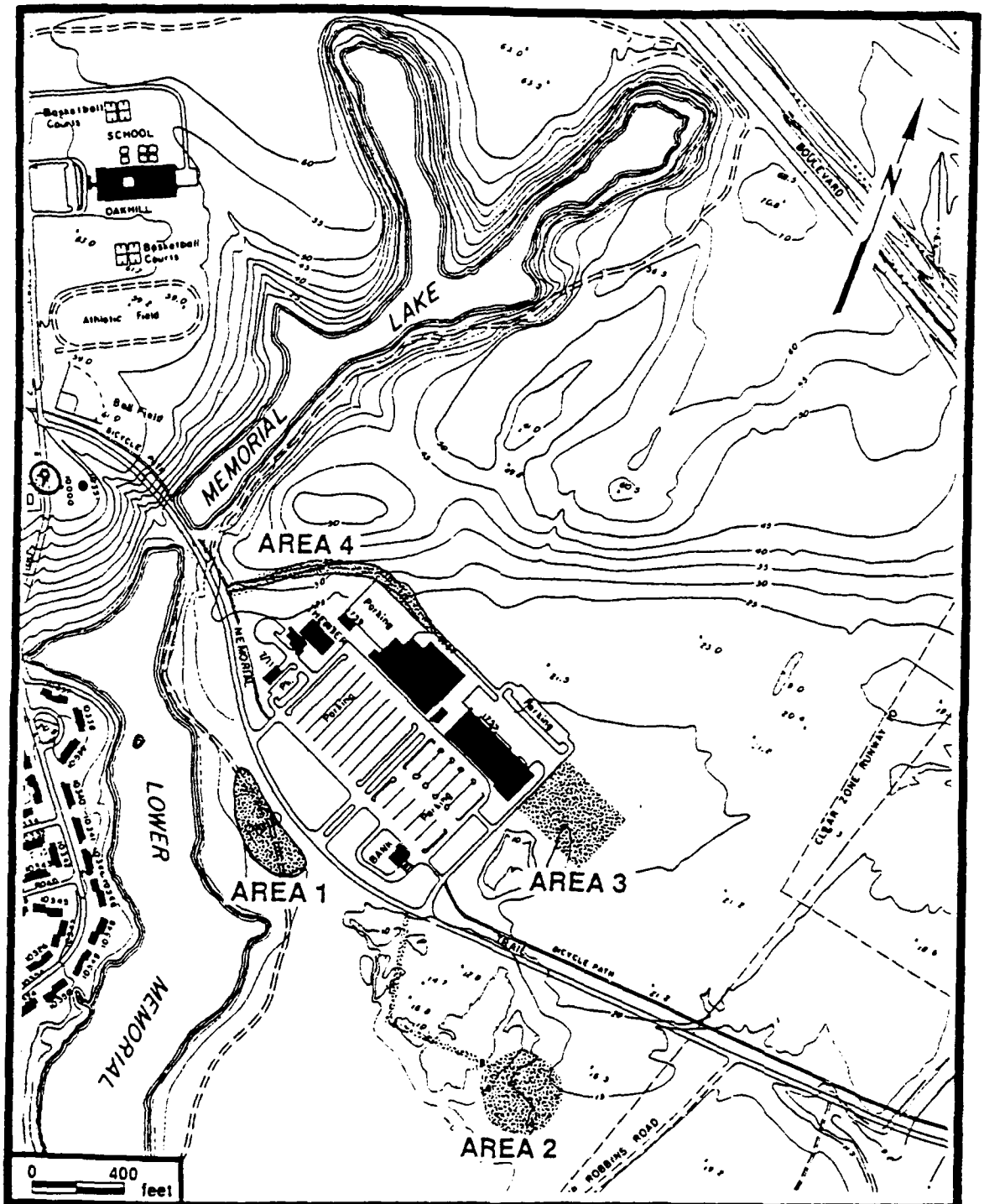


Figure 2. Location Map of the Proposed Commissary Addition

CHAPTER TWO
CULTURE HISTORY

To date, almost 900 cultural occurrences have been identified on Eglin and hundreds more are located in the Choctawhatchee Bay culture region, of which Eglin is a part. The synthesis of these combined data has led to significant advancements in the knowledge of regional culture history (*Thomas and Campbell 1990a*). It is not possible to reiterate all details of past occupation in this chapter, but we have highlighted some characteristics of prehistoric and historic Eglin.

Prehistoric Sequence

For reference in this discussion, Figure 3 is a chronological chart reproduced from the Technical Synthesis (*Thomas and Campbell 1990a*).

Paleo-Indian/Early Archaic

There is some, but not much, evidence of classic Paleo-Indian fluted points such as Clovis, and an examination of previously recorded sites off the base indicate these finds are rare. Most of the fluted points were found in the Bay waters near sites on the south shore of the Bay, which, because of lower sea level, was well inland during the Paleo-Indian period. The points certainly provide limited evidence that there was some movement into the area by the nomadic Paleo-Indians.

If the manufacturers of the classic fluted Paleo-Indian points were intensively exploiting the coastal zones of this region, evidence may now lie offshore. These early populations roamed a landmass considerably larger than present-day Florida. The rise of sea level around 6500 B.C. would have submerged any sites that were on the former coastline of the Gulf.

The best evidence of early occupation at Eglin is represented by point types that are variously viewed as Terminal Paleo-Indian or Early Archaic. Most common are Bolen points, although specimens of the types Santa Fe, Nuckolls, Dalton, Kirk Serrated, Suwannee and Wacissa were also found. These types are all similar in age and represent a change in technology away from production of the fluted points.

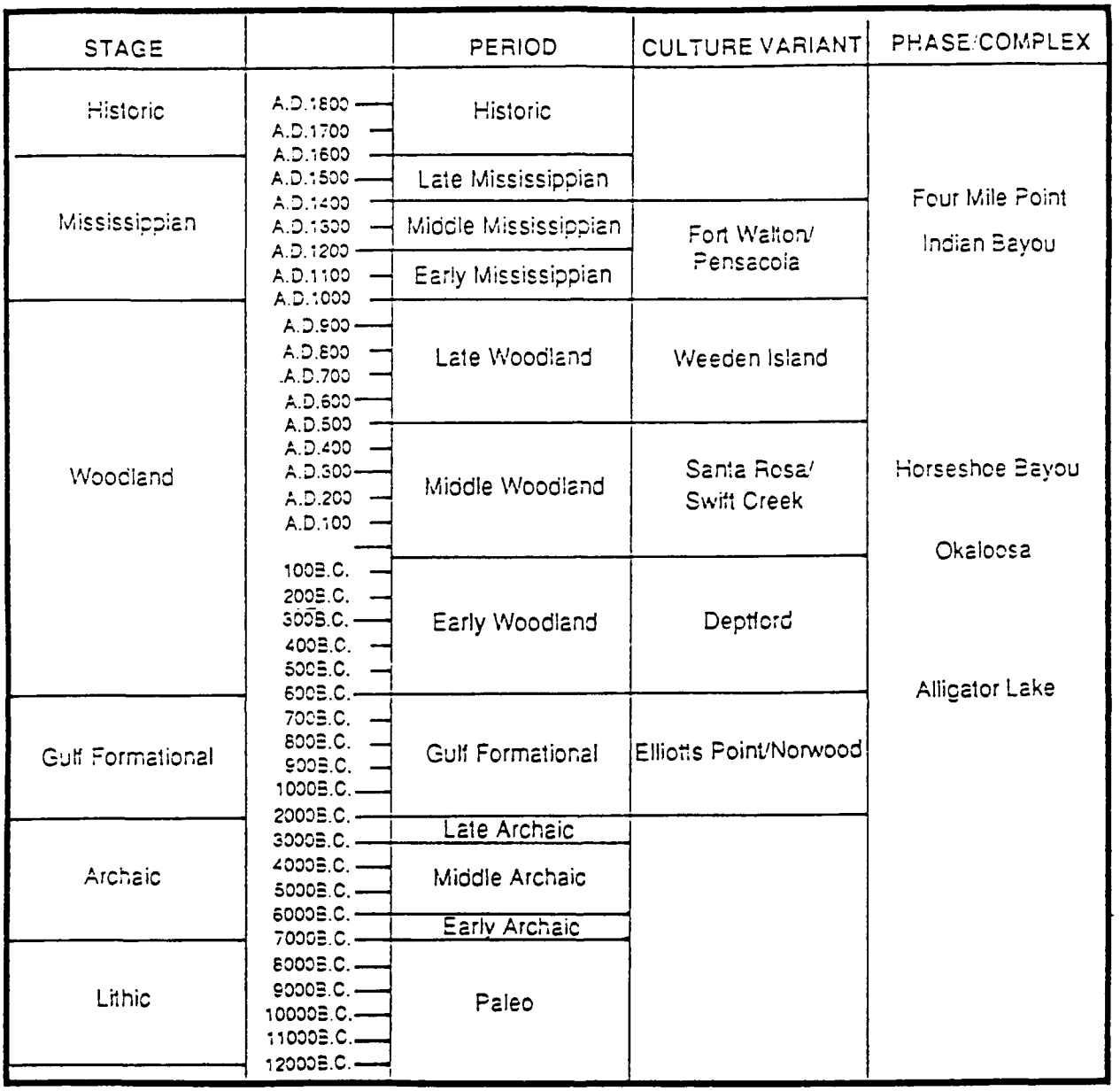


Figure 3. Suggested Culture Sequence for the Eglin/Choctawhatchee Bay Region

Most of the components are identified on the basis of a single diagnostic point and a number of Paleo-Indian/Early Archaic sites have not been investigated beyond the survey/recording level of effort. Consequently, we are unable to venture any suggestions as to site type.

The distribution of Late Paleo-Indian/Early Archaic remains indicates substantial use of the area. Some interesting trends are also apparent. A number of sites are situated on or very near tributary heads along major divides. Other sites are found along small drainages near the Yellow River.

Middle Archaic to Late Archaic

In the majority of cases, under this heading we are really discussing isolated projectile points rather than components. These points are referenced in the literature as simply spanning a range from the Middle to Late Archaic. The diagnostic types from sites on Eglin include Florida Archaic Stemmed (e.g., Marion and Putnam), Kays and Westo. Also included in the Middle to Late Archaic group is one site, 8Ok376, which produced two indeterminate points that appear generally Archaic in morphology. Remains from sites off Eglin are similar, although one site (8Wl65) produced an atlatl weight in addition to projectile points.

Both on and off Eglin, finds have been made at sites around Choctawhatchee Bay. In addition, one site was found on the Sound and another on East Bay. Due to the lack of clear artifact associations, site type is impossible to assess in almost all cases.

The major problem with interpreting these finds is the temporal overlap of point styles. Many of the types identified in the study area may be either Middle or Late Archaic or even Late Archaic to Woodland. Any of the points may have even been found and used by later occupants of the region so that their location in the archaeological record does not represent the place of initial discard. Overall, these diagnostics, when found in isolation, which is primarily the case at Eglin, have provided little for interpretation.

The most confusion is created by the Florida Archaic Stemmed types. Some of these chronologically ill-defined points have been firmly identified in Gulf Formational contexts. A good example is the Putnam point, an Archaic Stemmed type that is thrown into this dubious middle to late range, but which has also been identified in Elliotts Point contexts. Florida Archaic Stemmed points are also similar morphologically to Destin points which are a marker of Elliotts Point on Choctawhatchee Bay.

Gulf Formational

The median radiocarbon dates bracket the Elliotts Point Complex to somewhere around 2000 B.C. to sometime before 600 B.C. During this time frame the Eglin region witnessed what appears to have been a three-part development of Gulf Formational traditions, all related to the Elliotts Point Complex. From the radiocarbon dates at Meigs Pasture (8Ok102), it appears that the nascent stage of the Elliotts Point Complex occurs sometime around 2000 B.C. This stage is not as well defined as fluorescent Elliotts Point, but seems to be characterized by the beginnings of accretional mound deposition and the appearance of crude, amorphous baked clay objects.

Sometime after its initial appearance and before 1100 B.C., the Elliotts Point Complex fluoresced into its classic form, marked by a distinctive artifact inventory that includes well formed baked clay objects, known as Elliotts Point Objects for their similarity to Poverty Point Objects. Other artifacts typical of this assemblage include microliths and exotic items indicative of participation in the Poverty Point trade network and the distinctive Destin points.

Fourmile Peninsula, in Walton County, was clearly a focal point for the redistribution of trade items. Buck Bayou Mound, a massive shell midden, was likely the regional center around which populations gathered periodically to redistribute materials and feast.

The final development is distinguished by the introduction of fiber-tempered pottery into the Elliotts Point suite of artifacts. The precise point at which fiber-tempered ceramics were incorporated into the artifact repertoire is unknown, but Lazarus' (*1965*) radiocarbon date from the Alligator Lake site (8Wl29), off Eglin, indicates fiber-tempered pottery was present by 1100 B.C. How long the fiber-tempered tradition lingered after the decline of the Elliotts Point Complex is unknown.

Evidence of fiber-tempered ceramics in the absence of Elliotts Point Complex artifacts in locations away from the coastal areas may represent a fourth, perhaps transitional development of the Gulf Formational, but since only small numbers of scattered sherds have been found to date, the data are insufficient to address the issue.

With the decline of Elliotts Point by around 650 B.C., the Gulf Formational tradition was truncated in the project area by the emergent Woodland (Deptford) culture. With the exception of ceramics from one site (Alligator Lake-8Wl29) and isolated examples, there is no evidence of the Late Gulf Formational Alexander culture which succeeded the fiber-tempered tradition in the Mobile Basin.

Sometime around 1000 B.C., the pass to the Gulf from Choctawhatchee Bay was restricted by the formation of Moreno Point, the barrier spit at present-day Destin. This condition resulted in a shift in Bay shellfish species and may have had an effect on Elliotts Point culture as well.

Deptford Culture Variant

The environmental changes that took place in Choctawhatchee Bay sometime after 1000 B.C. resulted in adaptive shifts evident in the Deptford middens found in the project area. These adaptive shifts were accompanied by other cultural changes that were taking place and would ultimately lead to the decline in the Elliotts Point Complex. The combination of more refined techniques of ceramic manufacture, settlement shifts in response to lowered sea level and the decline of the powerful Poverty Point trade network created a situation in which Deptford culture became firmly established.

While there does appear to have been a radical shift in material culture, there is also some evidence of continuity between the Elliotts Point Complex and Deptford occupations. The continuity is attested to by a continued selection for coastal settings and the continued occupation of some, though not many, of the same sites.

The most dramatic aspect of Deptford settlement is a concentration of Deptford sites on the north shore of Santa Rosa Sound along the Narrows. This dense concentration of village sites begins at the Narrows where the Sound joins the Bay and continues west along the Sound shore. The Narrows represent a superb ecotone where the Bay and Sound converge and it is probable that this would have been a highly attractive setting.

Three phases have been suggested for Deptford in the region. The dates from Alligator Lake (8Wl29) and 8Ok126 confirm an early phase of Deptford, the Alligator Lake phase, beginning around 630 B.C. Stratum II at 8Ok126, which produced the date of 630 B.C., yielded 21 unidentified plain wares and seven eroded check stamped sherds, as well as one Deptford Bold Check Stamped and two Deptford Linear Stamped ceramics. The level from which Lazarus (*1965*) obtained the date of 625 B.C. at Alligator Lake produced seven Deptford Bold

Check Stamped, five Deptford Simple Stamped and two Deptford Linear Check Stamped sherds. It would appear from these data that the full suite of Deptford stamped ceramics was being manufactured by the earliest populations of this culture.

The early deposits at 8Ok126 were stratified under a later occupation for which we obtained two dates of 330 and 320 B.C. The associated pottery includes only 26 unidentified plain wares, an obliterated stamped sherd and seven eroded Deptford Check Stamped sherds. This assemblage provides an inadequate basis for distinguishing any differences between the ceramics of the two occupations, but the radiocarbon dates and the stratigraphic positioning make it clear that the site was occupied by two temporally distinct Deptford groups.

Additional excavation at sites like 8Ok126 may ultimately enable us to discriminate between the early and middle phase assemblages. However, Deptford culture apparently endured over a long period of time. Like their western counterpart, Tchefuncte, it may be the Deptford people were a conservative lot and slow to change.

Change does come around 50 B.C. when influence from Marksville to the west and Swift Creek to the east began to arrive. These changes are manifested as the Okaloosa phase, defined by Thomas and Campbell (*1985*) on the basis of work at the Pirates' Bay site and confirmed by excavations at Eglin.

The Late Deptford Okaloosa phase is dated by radiocarbon assays from samples at the Pirate's Bay (8Ok183) site to between about 50 B.C. to A.D. 150 (*Thomas and Campbell 1985*). The artifact inventory is characterized by a continuation of Deptford pottery, the presence of classic Santa Rosa series sherds, some Marksville remains and crude, incipient Swift Creek styles. It was clearly a time of renewed or heightened influence from the west and, with the introduction of Swift Creek styles from the east, the Okaloosa phase potters were actively engaged in ceramic experimentation.

The lithic assemblage contain interesting items that will continue into later Santa Rosa/Swift Creek times. The items are a collection of small, backed white quartz pebbles that appear to have been specialized tools.

Evidence gathered on Eglin and in the surrounding study area clearly show that settlement shifted from camps, small hamlets and specialized activity areas around a regional mound center during Elliotts Point to a settlement pattern reflecting the growth of central based villages in Deptford. With the beginning of Deptford, the area hosts large villages that were probably occupied year-round. Moreover, except for the changes in ceramics in the Okaloosa phase, there is little evidence of a difference in villages between Early, Middle and Late Deptford sites.

In addition to the central base villages, numerous small Deptford artifact scatters and shell middens are found throughout Eglin and the surrounding area. Many of these probably represent camps that were visited by village occupants for purposes of resource exploitation, but the data are inadequate to assess the time of occupation in most cases. Ample evidence of subsistence is provided by sites both on and off Eglin. Numerous middens indicate the Deptford people were engaged in the exploitation of shellfish. Oyster predominate, but *Rangia*, *Mercenaria*, *Strombus* and *Busycon* represent minor occurrences and there was an incidental amount of *Pecten*, moonsnail and *Fasciolaria*. It is, however, unlikely that shellfish exploitation accounted for a major part of their diet. The faunal remains from Deptford sites reveal that the occupants were actively hunting and fishing as well.

The best evidence for other subsistence pursuits is derived from the faunal remains at 8Ok126 on Eglin and deFrance's (*1985a*) detailed analysis of remains from Pirates' Bay

(8Ok183). Among the fish species are blue runner, Jack Crevalle, sheepshead, striped mullet, southern flounder, marine catfishes, black drum, red drum, specked trout, white trout, bluefish and some evidence of barracuda, sea bass and shark. Other faunal remains represented in Deptford middens include white-tailed deer, gray squirrel, fox squirrel, rabbit, opossum, rodents, striped skunk, muskrat and black bear. Migratory fowl and reptiles were also recovered.

The Deptford culture in the study area overall appears quite different from that found to the east. The absence of mounds is one difference and the apparent non-participation by Eglin area people in the Yent ceremonial complex is another. In the absence of any evidence of the burial mound tradition, the data from this region suggest the Deptford people disposed of their dead in prepared graves within or adjacent to their villages.

Santa Rosa/Swift Creek Culture Variant

After a long period of relatively conservative lifestyles and what appears to have been a reasonably stable economy based on fishing, hunting and shellfish collection, the Late Deptford Okaloosa phase occupants of the project area became the recipients of renewed outside influence. The continued appearance of Santa Rosa series pottery represents the spread of Marksville influence from the west, while Swift Creek traits were moving into the area from the northeast. As noted previously, environmental shifts occurred again in the Bay, altering the availability of certain shellfish species. These effects were marked by changes in the material culture, subsistence pursuits and community patterning. They are identified in the archaeological record by the appearance of sites of the Santa Rosa/Swift Creek culture variant.

Looking at the Eglin data in conjunction with that from the surrounding area, there are some significant differences in the patterns of Santa Rosa/Swift Creek site distribution versus that of Deptford. The major distinction appears to be a shift away from the central base villages on the Narrows to settings around Choctawhatchee Bay. The large Deptford village at Pirates' Bay (8Ok183) was abandoned after the Okaloosa phase and not reoccupied until Late Weeden Island. Although several Santa Rosa/Swift Creek sites are along the Narrows on the shore of the Sound, most of these represent camp-like occupations. Two sites outside Eglin may represent villages on the Sound.

Radiocarbon dates on Santa Rosa/Swift Creek sites on and off Eglin indicate a time range from around A.D. 150-200 to A.D. 500. Moreover, the data have been useful in defining the Horseshoe Bayou phase, representing the entirety of Santa Rosa/Swift Creek culture in the area (*Thomas and Campbell 1990b*). Three types of sites characterize villages during this time frame. They are linear shell middens, circular shell middens and horseshoe shaped shell middens.

Exploitation camps are represented by the remains on Eglin at 8Ok26, 8Wl176 and 8Ok107. The information on 8Ok26 is derived primarily from the work of Lazarus (*1958*). Situated near Jack's Lake on the west shore of Choctawhatchee Bay, the site produced a collection of Santa Rosa/Swift Creek sherds and appears to have been a seasonal camp. Although shellfish remains are reported in the midden, Lazarus (*1958*) does not identify the species and the midden had been destroyed by the time it was investigated by the NWR recording crews.

Among the mammal species represented in Santa Rosa/Swift Creek middens are appreciable remains of white-tailed deer, which deFrance (*1985b*) reports are overwhelmingly the most important mammalian species represented at a number of sites she has researched. Other mammal remains included domestic dog, opossum, swamp rabbits, raccoon, striped skunk and unidentified rodents. A wide variety of fish species were obtained, including blue runner, Jack Crevalle, sheepshead, hardhead catfish, Atlantic croaker, flounder, red and black drum,

speckled trout, sea bass and several others. There is also evidence that turtles, alligators and snakes were exploited for food. Avian remains include common loon, king rails, lesser scaup, green-winged teal, mallard and the American pintail.

The material culture of Santa Rosa/Swift Creek is also well documented. The data clearly demonstrate that the populations were actively engaged in long distance trade. Sheet mica and copper both represent exotic items of trade. There is also evidence of the importation of opaque quartz pebbles, Fort Payne chert, rose chert, greenstone, quartzite, clear quartz and quartz crystals.

Ceramics include St. Andrews Complicated Stamped, West Florida Cord Marked, Crooked River Complicated Stamped (in minor quantities), Gulf Check Stamped (only if they have scalloped rims), Franklin Plain (only identified if with scalloped rims), Alligator Bayou Stamped, Santa Rosa Stamped and Basin Bayou Incised. Noticeably infrequent is the type New River Complicated Stamped, a presumably early marker of Santa Rosa/Swift Creek and one that was found in association with the Okaloosa phase of Deptford.

Many of these sites produced appreciable quantities of shell and vertebrate faunal remains. Worked bone from Horseshoe Bayou include drilled teeth, presumably used as pendants, and polished, pointed pieces of bone that were utilized as pins, awls or punches. Similar items have been recovered from other sites in the area.

A shift from oyster to *Rangia* exploitation by Santa Rosa/Swift Creek occupations on Choctawhatchee Bay is clearly documented in the archaeological record. The clear majority of Santa Rosa/Swift Creek shell middens at sites in settings around the Bay are dominated by *Rangia* with little to no evidence of oyster. This is a marked change from the pattern of Deptford groups, but did not extend into later Weeden Island times when oyster was again the most sought after shellfish species.

It is our belief that the shift to *Rangia* exploitation by Santa Rosa/Swift Creek people was not due to a preference for that particular species. Apparently, a change in salinity took place in Choctawhatchee Bay that led to an increased availability of *Rangia* during the time the area was occupied by Santa Rosa/Swift Creek populations and perhaps began during the Late Deptford occupations.

Weeden Island Culture Variant

Remains of Weeden Island occupation are literally broadcast over the reservation and in the immediate areas outside of Eglin. Although coastal settlement continues, the interior patterns of distribution reflect a sharp change in land use from that evidenced by the occurrence of Deptford or Santa Rosa/Swift Creek sites.

The issue of chronology is an intriguing one for Weeden Island and cannot be summarized here (refer to *Thomas and Campbell 1990a*) with any thoroughness, so we will only provide the basis for the divisions. We recognized three types of assemblages that characterize the Weeden Island sites in the Eglin area. The sites labeled Early Weeden Island-A contain assemblages typically regarded as representing early collections (*Willey 1949; Percy and Brose 1974; Tesar 1980a; Mikell et al. 1989*). Those designated Early Weeden Island-B contain assemblages with high frequencies of incised and punctated Weeden Island types without any evidence of Santa Rosa/Swift Creek ceramics. These sites are distinguished on the map because a radiocarbon date on one, 8Wl191, indicates a very early appearance of Weeden Island in the project area. The Late Weeden Island sites are rather self-explanatory, containing assemblages characterized by relatively high frequencies of Wakulla Check Stamped ceramics without any evidence of Swift Creek Complicated Stamped.

While there is ample evidence of extensive cultural interaction by coastal plain populations, the factors responsible for the marked change in settlement and population increase are not completely clear. Percy and Brose (*1974*) regard the trends as a reflection of the increased importance in horticulture. This is very likely a factor, although no direct evidence of horticulture has been documented in the Eglin area.

The types of sites represented by Weeden Island remains in the Eglin area include mounds, villages, hamlets and camps. From the evidence accumulated to date, no marked change in community patterning appears through the period of Weeden Island occupation except for an increase in the number of sites.

Villages in the Eglin area are both large and small shell middens much like those described by Milanich and Fairbanks (*1980*). There are several configurations that characterize Weeden Island village middens, which have been confidently identified only in coastal settings in the study area. In many cases, the sites contain linear deposits that actually represent a number of overlapping small, circular shell heaps. The Weeden Island occupation at 8Wl68, on the north shore of the Bay, is an excellent example of this type of village. This site contains a number of oyster shell heaps in the western portion, but they overlap to form a continuous midden in the eastern part of the site. There is also some evidence of prepared living surfaces at these linear Weeden Island middens.

8Ok380, also situated on the Sound near 8Ok133, typifies another configuration. It is a horseshoe-shaped shell midden that represents a small Weeden Island village. The semicircular or horseshoe-shaped arrangement appears to be characteristic of Weeden Island as well as Santa Rosa/Swift Creek community patterning (*Milanich and Fairbanks 1980*).

Milanich and Fairbanks (*1980*) comment that some villages in northwest Florida were situated away from the coast in ecotonal settings between the coastal scrub flatlands and the coastal strand. There is little evidence of that particular village setting, although villages are found near freshwater streams both on the shore of the Bay and on the Sound.

To date, we have identified no village middens in the interior such as those found in the Apalachicola-Chattahoochee-Flint rivers area (*Milanich and Fairbanks 1980*). There is, however, increased evidence of settlement in the interior of Eglin and we believe that some of these must have been villages. In particular, we find Weeden Island sites strung out in semicircular fashion around springheads, a trend suggested by Milanich and Fairbanks (*1980*) as distinctive of the culture. The Torreya site (8Li18) in Liberty County represents such a situation where several houses were situated in a crescent fashion around a springhead (*Percy 1971*).

Two Eglin sites in the western portion of the study area may represent a similar situation. 8SR19 produced a Weeden Island collection from deposits around the springhead of Indigo Creek, a tributary of Boiling Creek. In that same area, 8SR20 is located at the springhead of Little Boiling Creek. This situation may be a pattern in the interior of Eglin.

The community patterning and distribution of sites suggest that the Weeden Island populations were engaged in a seasonal round. Whereas Deptford and Santa Rosa/Swift Creek people appear to have established year-round villages on the coast, the central base village does not seem as strongly indicated by the Weeden Island data. Milanich and Fairbanks (*1980*) make a similar observation in their discussions of Weeden Island in general.

Subsistence remains were recovered from several sites with Weeden Island components, but some of these had multiple occupations. The best information on subsistence is derived from 8Ok151, a single component Late Weeden Island site, and 8Ok133, a predominantly Early

Weeden Island-A site with a minor occurrence of Deptford remains. Most of the faunal remains from these sites represent the remains of fish, although white-tailed deer, unidentified mammal, unidentified avian, freshwater turtle and pond/cooter turtle were also recovered. Collections from data recovery level excavations would likely reveal extensive evidence of hunting.

Fish remains indicate the Weeden Island people were taking full advantage of the Bay, Sound and Gulf. Represented in the collections are boney fish, herring, saltwater catfish, sea catfish, jack, porgies, sheepshead, mullet, flounder, bowfin, drum and gar. Most of the middens, as noted, were comprised of oyster, although *Rangia* is found at sites on the Sound and the bayous. One site, 8Ok151, produced crab remains.

Ceremonialism, represented by ritual mound burial, reaches a peak in the Eglin area during Weeden Island times. Milanich and Fairbanks (*1980*) observe that it is only in northwest and north Florida that we see the patterned burial mounds with east side deposits. Within the Eglin area there are 16 Weeden Island mounds, three of which are on Eglin proper (8Wl13, 8Ok85 and 8Ok174).

Fort Walton/Pensacola Culture Variant

The Eglin project area, like much of the northern Gulf Coast, witnessed a replacement of Late Woodland culture (Weeden Island) by the Fort Walton and Pensacola Mississippian culture variants no later than A.D. 1200 and probably somewhat earlier. As Tesar (*1980b*), Brose and Percy (*1978*) and others have pointed out, a general Weeden Island sand-tempered ceramic tradition appears to metamorphose into Fort Walton in both the Choctawhatchee and St. Andrew bay areas without much evidence of an evolutionary transition. While this is probably not entirely true and does not argue for instantaneous Mississippianization or invasion, there is no clear evidence to characterize the period of two to three hundred years of late Weeden Island to Fort Walton transition. Knight (*1984*) points out that the transition lacks clarity for the Pensacola variant as well.

The late prehistoric culture of northwest Florida had at least two regional expressions, Fort Walton and Pensacola. Fort Walton and Pensacola share traits with each other as well as with other Southeastern Mississippian groups. Willey (*1949*) defines the Fort Walton culture and appends the Pensacola ceramic series to it. Recent investigations, however, have demonstrated that Fort Walton and Pensacola are distinctive cultural expressions, or variants, of a more generalized Southeastern Mississippian cultural development. Artifact assemblages, mound and community settlement system patterns and behavioral norms inferred from the archaeological data "leave no doubt that they were Mississippian peoples with social and political systems that were more complex than those that had previously evolved in [northwest] Florida" (*Milanich and Fairbanks 1980:193*).

In terms of ceramics, Fort Walton is generally characterized by distinctively incised and punctated as well as plain grit- and/or sand-tempered pottery found in both coastal and inland riverine sites (*Willey 1949: 452-488*). The Pensacola variant (*Fuller and Stowe 1982; Fuller 1985; Stowe 1985*) is distinguished from Fort Walton by its shell-tempered decorated and plain ceramics (*Willey 1949*) that dominate assemblages with minor sand tempered components (*Fuller and Stowe 1982*).

Both Fort Walton and Pensacola series pottery is found in the Eglin study area, represented on base by 29 sites. At some of the sites, only a few sherds were recovered; these are little more than occurrences of minimal interpretive value. The remaining sites, however, provide useful data. While many of the sites also exhibited evidence of earlier prehistoric occupation, several are single component sites.

The most striking aspect of the settlement distribution is the resurgent selection for coastal locations to the almost complete exclusion of interior settings. This pattern of distribution represents a marked departure from that seen during Weeden Island. Of the Fort Walton/Pensacola components on Eglin, only three are located well into the interior, all found on the Yellow River. Two other interior sites are situated on south-flowing tributaries.

The village plan of Fort Walton/Pensacola sites is documented by Lazarus (*1971:45*) in his overview of areas west of the Apalachicola River. The principal type of village in the area of Choctawhatchee Bay is represented by 8Wl51, an off-Eglin site on the west side of Hogtown Bayou, which he describes as "...six or seven small midden piles of shell...arranged in a pattern" (*Lazarus 1971:45*). The data from the Eglin study are consistent in that almost all major villages are characterized by accumulations of shell that are deposited as individual heaps.

Major villages were likely occupied year-round by at least limited populations, while the smaller hunting, gathering and horticultural loci were occupied seasonally by only small groups. If horticulture was an economic concern, it may have occurred only at small, scattered sites where arable soils were present (*Larson 1980: 206-219*) or it may have occurred at both small sites and near villages, as well.

Smaller Mississippian coastal sites on Eglin are less intensively utilized non-nucleated sites related to probable hamlets. These could represent dispersed households, and resource exploitation or special function sites (camps). Examples of probable coastal hamlets have been found at a number of sites and there are also others that may be interior remains of a hamlet. Camps may be related to population fissioning and dispersal on a seasonal or periodic basis. As with Curren's (*1976*) and Larson's (*1980*) models for late prehistoric coastal subsistence adaptations, the Eglin settlement system implies that there was a scheduled population movement both between villages and smaller sites and likely between villages, themselves. These population movements must have been scheduled to take advantage of optimal exploitation conditions.

Although there are fewer mounds than those observed for Weeden Island sites, there is clear evidence of ceremonialism in Fort Walton/Pensacola culture. Six mounds exist in the Eglin area, although none occur on Eglin proper. The mounds contain a variety of Fort Walton/Pensacola ceramics.

The most impressive of the mounds is clearly 8Ok6, the Fort Walton Temple Mound, a large, platform mound that measures 12 feet in height, 223ft by 220ft at the base and 90ft by 150ft at the summit (*site record form*). Over 80 burials are reported to have been interred in the Fort Walton Temple Mound; it must surely have been a regional center of Fort Walton/Pensacola activity. The site has been the subject of several investigations which have produced evidence of multiple burials, shell and bone tools, shellfish and vertebrate fauna, lithics and mica.

In addition to mounds, four Mississippian cemeteries are located in the study region, although none are found on Eglin proper. The cemeteries occur in each of the clusters of Fort Walton/Pensacola sites except the one at the Narrows where the Fort Walton Temple Mound was constructed. The cemeteries contain human burials and grave goods, most notably a number of ceramics. Although not confirmed as a cemetery, Eglin Forest Rangers reported that a burial was uncovered at 8SR17 on East Bay.

Until recently, the dating of Fort Walton/Pensacola culture in the Eglin and Choctawhatchee Bay region has been hampered by a lack of radiocarbon dates. Mikell (*1990*) has recently compiled radiocarbon dates to develop two phases. Mikell's (*1990*) formulation of phases is based on the increasing frequencies of Pensacola series pottery in Late Fort Walton

sites. The Indian Bayou phase sites are dominated by Fort Walton series pottery with small frequencies of Pensacola series sherds. The Four Mile Point phase is characterized by relative frequencies of Pensacola pottery from around 30 to 40% to as much as 70% in the collections. Examining the ceramic assemblages from area sites and radiocarbon dates, Mikell (*1990*) is able to place Choctawhatchee Bay area sites into one of the two phases.

History

The historic reconstruction of developments in the Eglin region presented in Thomas and Campbell (*1990a*) is extremely detailed and based on not only the archaeological work, but an exhaustive review of documents, archives and old maps. It cannot be summarized adequately. As such, several paragraphs below provide some of the highlights, but the reader is referred to the Eglin Technical Synthesis (*Thomas and Campbell 1990a*) for a thorough presentation.

The populations at the time of Contact are unconfirmed, but were probably a continuation of the late Fort Walton/Pensacola groups of the Fourmile Point phase. These groups apparently continued to survive according to the same adaptive strategy followed before Contact. Both archaeologically and in the documentation, there is little evidence that colonial powers actively pursued contact with the aborigines of the Choctawhatchee Bay region.

There are few Contact Period artifacts, most being in cemeteries. Moreover, there is no evidence of trading posts and no missions were established. It has been suggested that the Spanish may have passed this region by because the opening to the Gulf at East Pass would be difficult to discern from an offshore position.

The later historic periods can be ordered into three divisions, the Pioneer Period, the Rural Industrial Expansion Period and the Military Proprietorship Period.

The archaeological investigations produced evidence of nine Pioneer Period sites of European origin; these include eight homesteads and one mill. Predictably, seven of these are located along the Yellow River Drainage System (8Ok88, 8Ok97, 8Ok321, 8Ok398, 8Ok413, 8SR117 and 8SR192). The other two sites, 8SR239 and 8SR240, are situated along East Bay. Interestingly, the two sites along East Bay are somewhat of an anomaly since there are no structures documented on any of the early maps for this zone and none of the references indicate settlement during the Pioneer Period.

The paucity of settlement along this and other coastal areas came as something of a surprise. Besides Camp Walton, only 14 homesteads are documented in the literature and source materials as being located in this zone during the Pioneer Period. One trading town and port, Freeport, was established between 1840 and 1860; otherwise, the coastal strip was very sparsely inhabited. Most of the other coastal communities such as Fort Walton, Niceville and Destin were not established until the late 19th and early 20th centuries during the Rural Industrial Expansion Period.

The expansion of Southern rural industry in west Florida was stimulated by a resurgence of political stability and economic investment, the latter encouraged by improved transportation systems, most notably, the arrival of the railroad. The construction of rail lines in Florida and throughout the South in the 1880s led to a boom in the extraction of natural resources that would, for a brief period in history, alter the nature of individual and community settlement patterns throughout the South.

A total of 257 cultural occurrences can be ascribed to the Rural Industrial Expansion Period. These included 125 sites, 87 isolated finds and 45 turpentine cup concentrations. Of the 125 sites, 26 are related to forest resource exploitation and industrial communities; 71 represent

remains of rural homesteads and fishing, shipping or agricultural communities. An additional 18 of the sites are coded as miscellaneous, with a variety of functions relating to the work and travel of Rural Industrial settlers. The remaining 10 sites are generalized scatters with no clear evidence of affiliation. Likewise, no attempt was made to interpret the 87 isolated finds. The 45 turpentine cup concentrations were, of course, evidence of forest resource exploitation activity.

The last 50 years (1940-1990) have been a period of Military Proprietorship for the Eglin reserve and a period of growth in the tourist trade for the Fort Walton area. The creation of Eglin with the acquisition of the Choctawhatchee National Forest in 1940 resulted in significant changes in the settlement patterns and economy of the region. Over the years, Eglin and Hurlburt grew to encompass large portions of three counties, with a military population half that of Okaloosa County and an annual budget of hundreds of millions of dollars. Many of its missions and projects were and are of national and worldwide importance.

The history and evolution of Eglin Air Force Base have been extensively documented by Eglin historians (*Kessler 1982; Massoni 1988; Angell 1989a, 1989b*) and NWR (*Thomas and Campbell 1990a*). From less than auspicious beginnings, Eglin grew to play a major role in both research and defense of this country.

In recent years, Eglin has continued testing military hardware, including the B-1B Bomber and the Stealth 117 fighter and has also been directly involved in political and humanitarian as well as military events. In 1988, the training of the Nicaraguan Contra Rebels at Hurlburt Field resulted in a series of demonstrations by dissenting factions. In addition, the base has provided humanitarian aid in the form of temporary housing to Vietnamese refugees in 1975 and Cuban Refugees in 1980.

The base has also played an important role in recent military events. Units from Eglin and Hurlburt have been involved in the aborted Iranian hostage rescue attempt in 1980, the Panamanian Campaign in 1989, and the Desert Shield project in 1990 as well as the Desert Storm operation in 1991.

CHAPTER THREE
METHODS, RESULTS AND RECOMMENDATIONS

Research Design

We have previously mentioned the Technical Synthesis, generated by NWR on the basis of eight years of research. That document was part of the Historic Preservation Plan developed for Eglin by NWR. As part of our commitments, NWR developed a predictive model of site location and produced a planning manual to guide Eglin personnel through the steps of proper cultural resources management. One of the aids is a set of maps. The first series shows all areas that have been surveyed; if sites were found, they are also illustrated and distinguished by significance category (significant, potentially significant or not significant). The second series delineates probability areas and significant or potentially significant sites. By using these maps in conjunction with planning for mission activity or construction, Eglin personnel will know the degree, if any, of concern that will be raised over cultural resources.

Prior to initiating the field work, NWR compared the probability maps with the areas of planned construction. In consultation with Richard Hartman and Jesse Borthwick, it was learned that four areas required investigation. For convenience, the areas were designated numerically.

As can be seen by Figure 4, a copy of the Fort Walton Beach 7.5' quadrangle used in the probability map series, only Area 1 and a portion of Area 4 were within a high probability zone. The majority of Area 4 and all of Areas 2 and 3 were in low probability areas. The only known site in the vicinity is 8Ok16. Although a potentially significant site, 8Ok16 is situated well outside the areas of proposed impact and its integrity is not threatened.

The presence, however, of high probability locales within the construction area suggests a potential for additional sites in the area of concern. Consequently, a program was designed to ensure proper coverage of the high probability areas and confirmation that the low probability areas were, in fact, without site potential. This examination was regarded as especially important as this project represented the first time the probability maps had been used in planning.

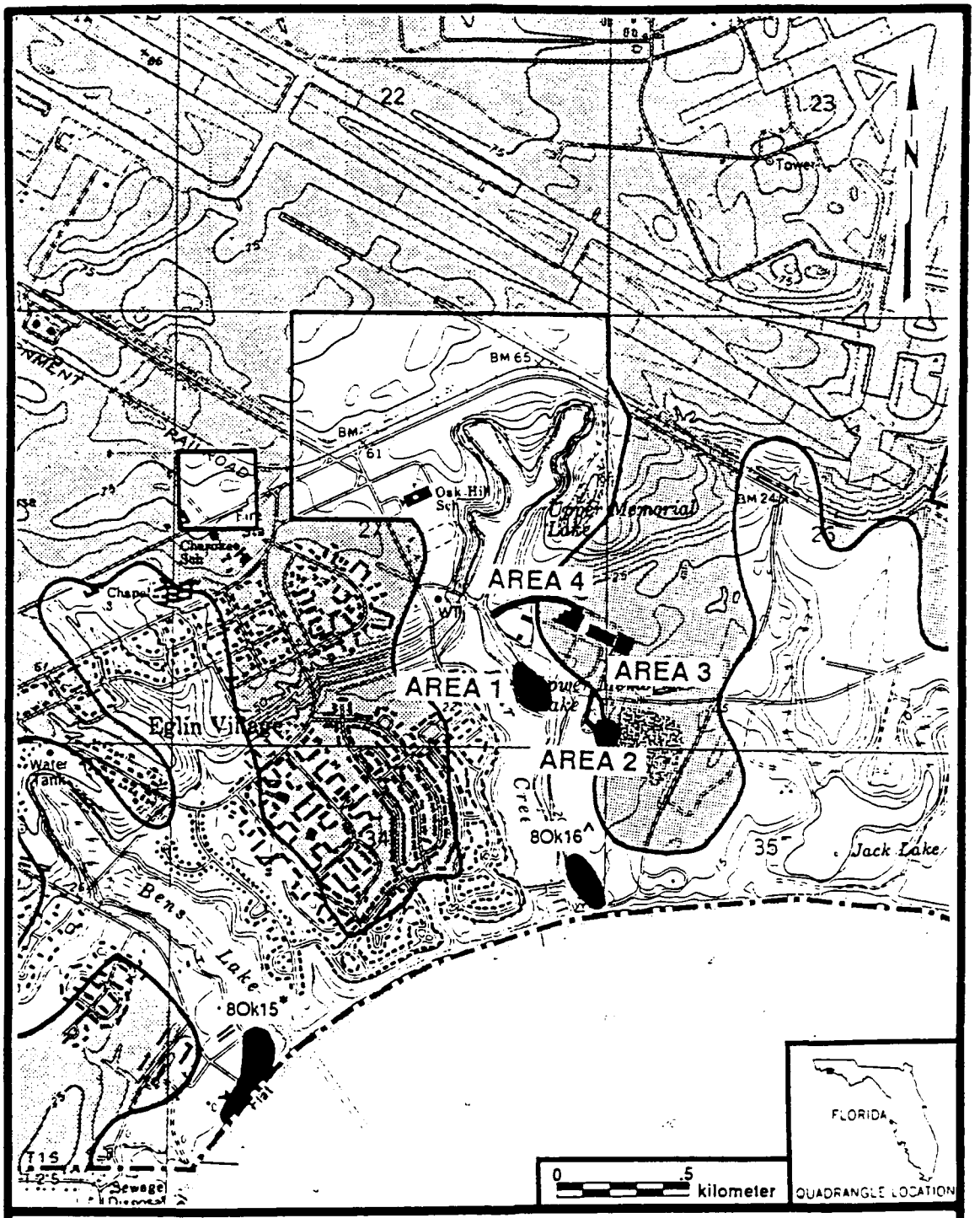


Figure 4. Portion of the Fort Walton Beach 7.5'Quadrangle Showing Areas of High and Low Probability and Known Sites

Field Work

Field work was initiated with a general reconnaissance of all four areas. Evidence of disturbance (discussed below) was observed in the low probability areas and portions of the high probability zone. Since the project area is not one contiguous block, each of the four areas are discussed separately below.

Area 1

Area 1 (Figure 5) is located in a high probability zone and measures about 66m by 82m. The area is covered in mixed hardwood and pines with an understory of vines and briers. No surface visibility is afforded by the vegetation cover. However, the area is cross-cut by a few roads that were clear and could be examined.

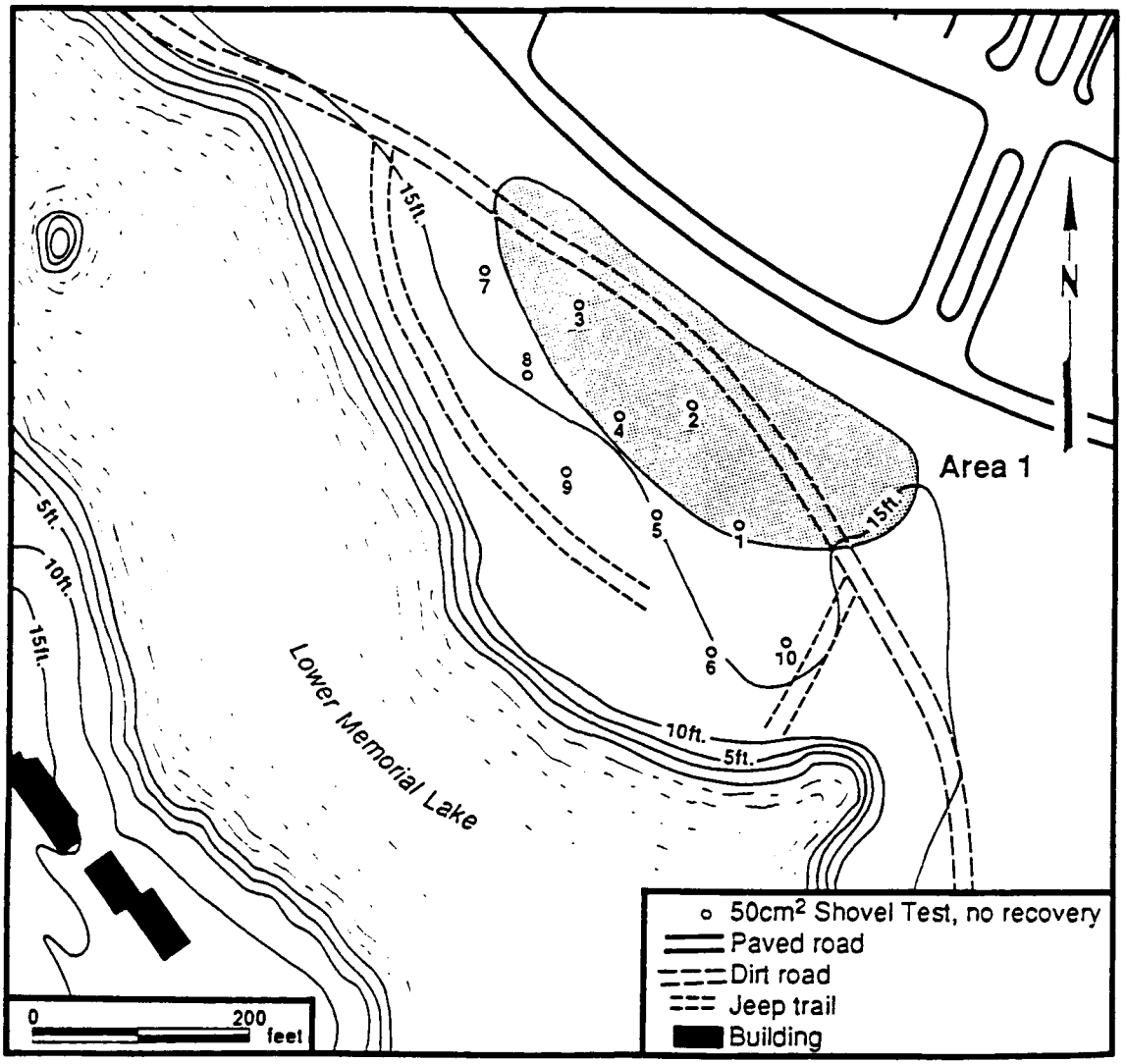


Figure 5. Sketch Map of Area 1

In the wooded area, NWR crew excavated 10 50cm^2 shovel tests at 30m intervals. The shovel pits were excavated to varying depths, but each was excavated to at least a meter or more below surface. The soil from each pit was screened through 1/4 inch hardware mesh to ensure adequate artifact recovery. None of the units produced any artifacts or evidence of cultural deposits.

A typical profile for the area is that recorded in Shovel Test 1 (Figure 6). Stratum I is a dark brown organic humic horizon that extends from the surface to about seven centimeters. Stratum II, extending to about 17cm, is brown to dark brown fine sands. Underlying that zone is Stratum III, a yellowish brown zone of fine sands that extended to the base of all excavation units.

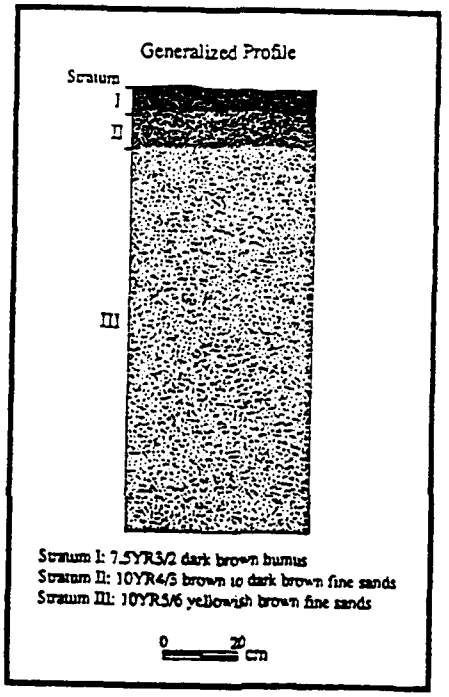


Figure 6. Soil Profile from Shovel Test 1, Area 1

In addition a surface inspection was made of the roads. Some shell and rocks were observed in the road and examined. The shell is not associated with any midden and none of the stone revealed any evidence of use or modification. The only indication of cultural activities, other than those of the modern day, is a former turpentine tree that was noted in the field. At some point in the past, the area was exploited by the naval stores industry, although no artifacts are left behind to demonstrate their presence except the source of the rosin.

Area 2

Area 2 (Figure 7) is located partially within low and high probability areas. Covered in mixed pine and hardwoods, this area has been extensively disturbed by borrowing and road construction. A series of four 50cm^2 shovel pits were placed in the wooded area, in the high probability zone where the only potential for undisturbed deposits existed. None of these units produced any artifacts or cultural deposits.

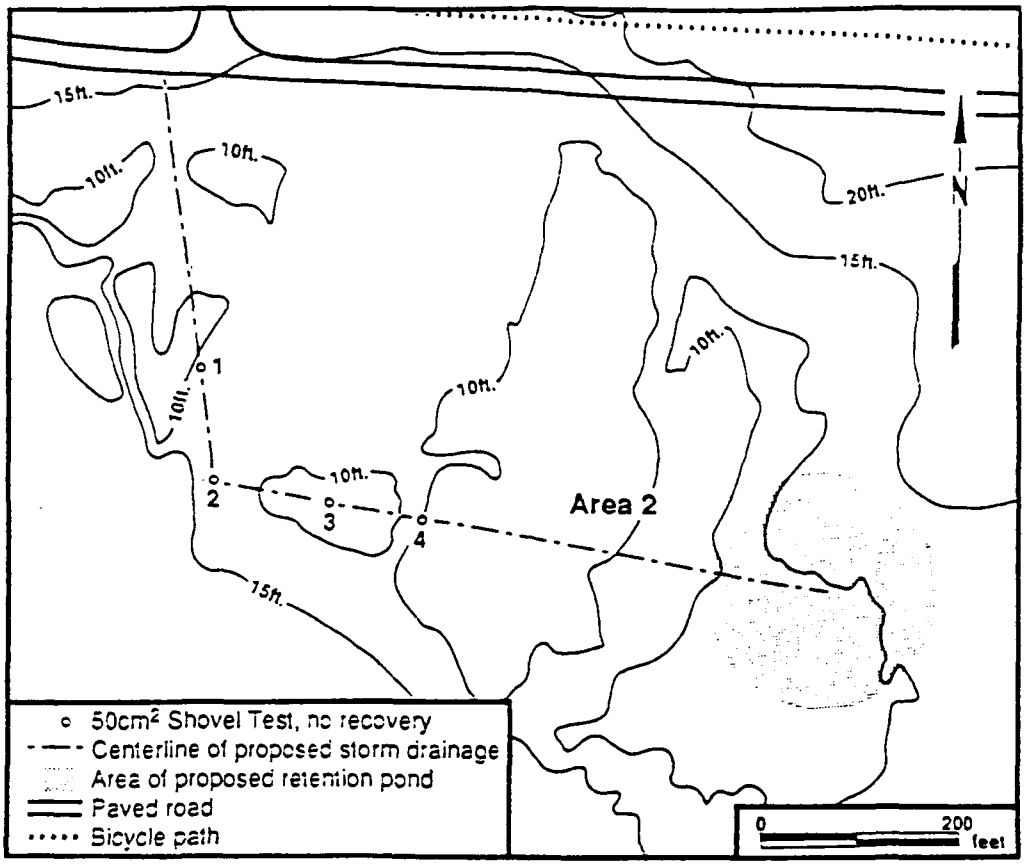
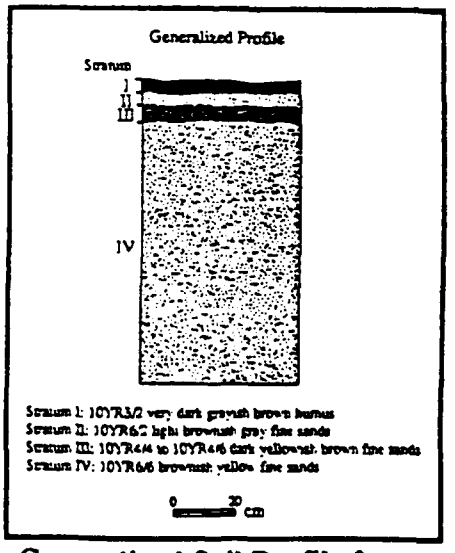


Figure 7. Sketch Map of Area 2

The profile (Figure 8) is similar to that in Area 1. From the surface to about four centimeters is a very dark grayish brown A horizon, underlaid to about eight centimeters by a brownish gray E horizon. Stratum III is a dark yellowish brown zone to about 14cm and underlaid by brownish yellow sands to at least 95cm.



Figur 8. Generalized Soil Profile from Area 2

The surface in non-wooded areas was traversed and carefully inspected. This locale contained some broken glass, but all of these remains were the result of recent discard.

Area 3

Area 3 (Figure 9) is wholly within the low probability area, adjacent to the existing commissary. Surface visibility was excellent, however, this area is next to the site of the old Eglin landfill and disturbance is extensive. It is also in the location of a borrow pit. Vehicular movement over the area has resulted in severe erosion that has impacted Area 3.

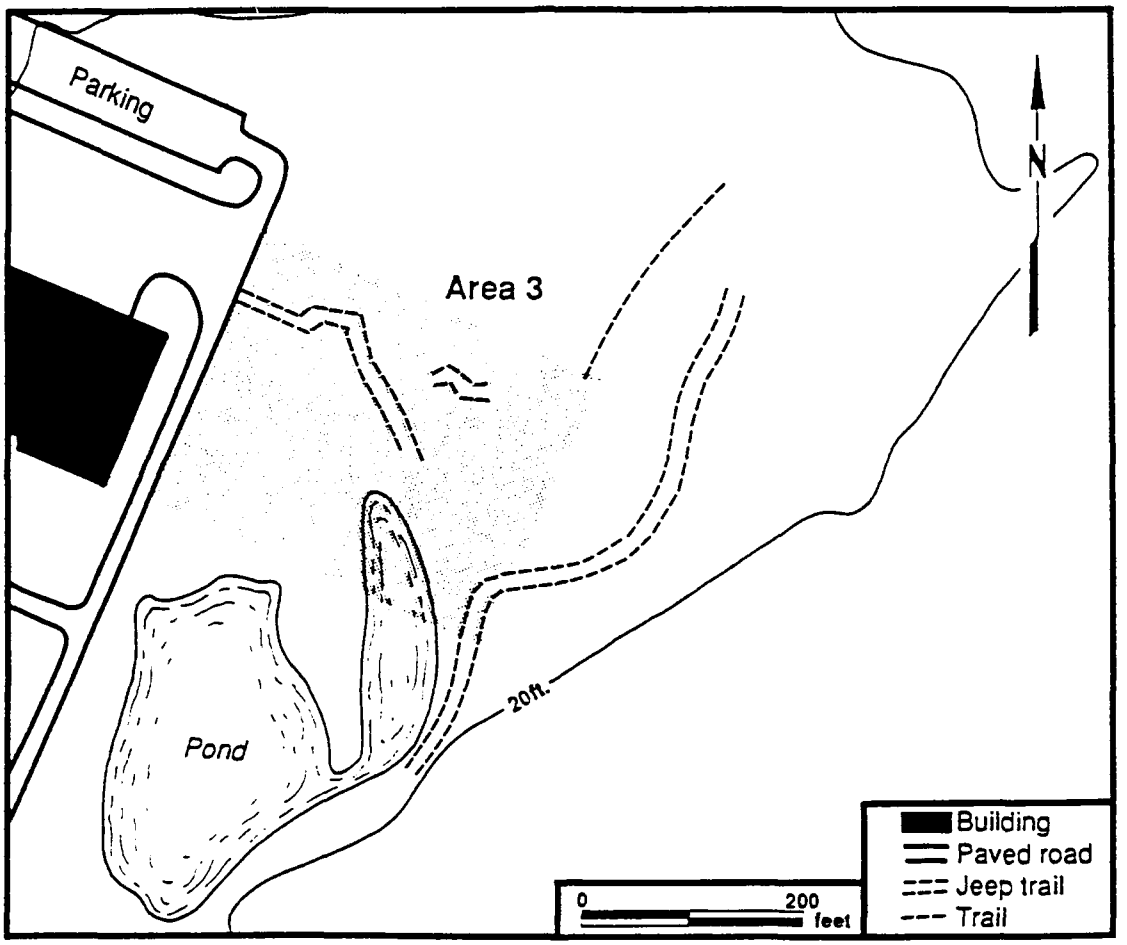


Figure 9. Sketch Map of Area 3

The entire area was traversed and the surface examined. The only remains consisted of recent discard and an occasional shell. There is no evidence of a site or even isolated find and any that might have existed would be totally destroyed by the degree of disturbance.

Area 4

Also within the low probability zone is Area 4 (Figure 10), which is a proposed road. The proposed road exits off the Parking lot behind the commissary, proceeds to a powerline ROW and heads southwest toward Memorial Rd. The entire area is cleared due to powerline ROW construction and maintenance. As a result of vehicular use, portions of the dirt road following the powerline are entrenched to approximately 30cm.

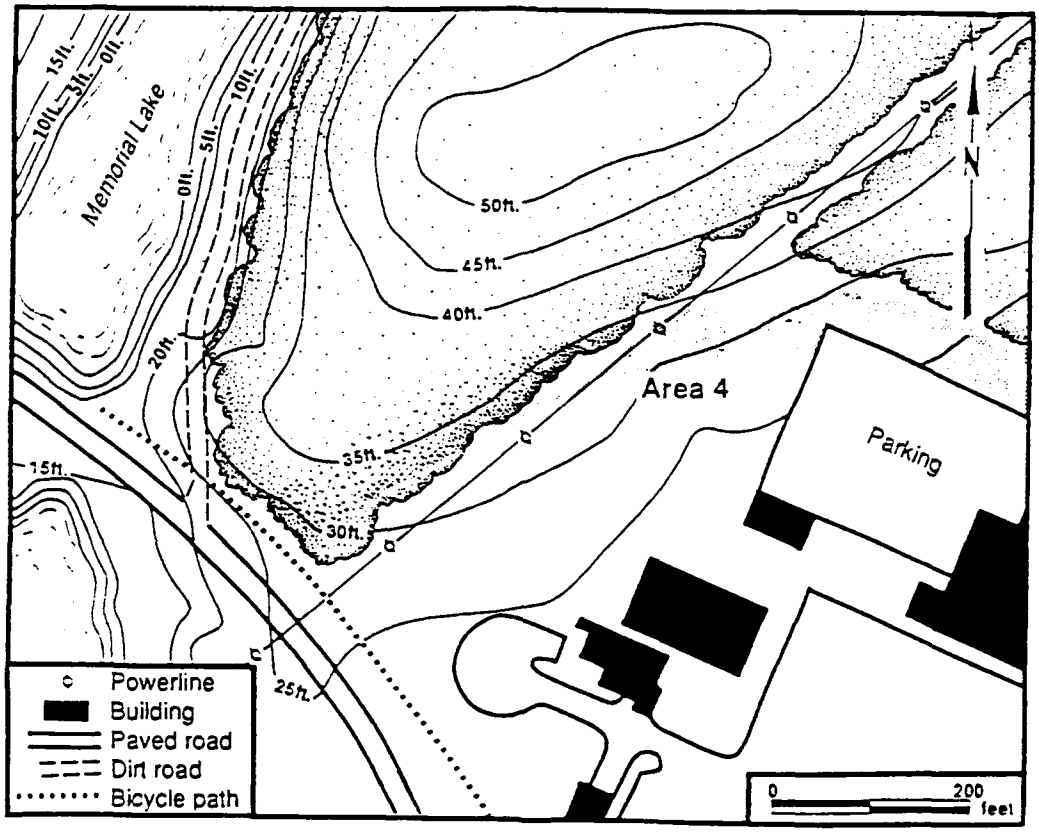


Figure 10. Sketch Map of Area 4

The crew walked all of Area 4, examining the surface for artifacts. Only recent trash and shell associated with road fill were observed. As was the case with Area 3, disturbance has had a major impact on this area.

Recommendations

NWR has thoroughly investigated the four areas where construction, associated with the commissary addition, is planned. Those areas or portions of areas within the low probability zones lack integrity and are accurately depicted on the maps as low probability areas. The map series, however, will need to be revised in these areas to show that they have been surveyed and no sites have been found.

In the high probability zones, subsurface testing revealed an absence of artifacts or cultural horizons. Sterile yellowish brown or brownish yellow sands begin at a shallow depth, between about 14 and 17cm, and continue to a meter or more. Likewise, the maps should be revised to illustrate these as areas that have been surveyed.

In the absence of cultural remains, NWR recommends that construction in the four areas associated with commissary addition be allowed to proceed. No cultural resources will be threatened with adverse effect as a result of the proposed work.

BIBLIOGRAPHY

Angell, Joseph W.

1989a **History of the Army Air Forces Proving Ground Command part one historical outline 1933-1944.** Office of History, Munitions Systems Division, Eglin AFB.

1989b **History of the Army Air Forces Proving Ground Command part one background of Eglin Field 1933-1940.** Office of History, Armament Div. Eglin AFB.

Brose, David S. and George W. Percy

1978 Fort Walton settlement patterns. In **Mississippian settlement patterns,** edited by Bruce D. Smith. Academic Press, New York.

Curren, Cailup B.

1976 Prehistoric and Early Historic occupation of the Mobile Bay and Mobile Delta area of Alabama with an emphasis on subsistence. **Journal of Alabama Archaeology** 22 (1):61-84.

deFrance, Susan

1985a **Analysis of vertebrate faunal material from 8Ok183, Pirates Bay site, Okaloosa County, Florida,** Unpublished manuscript on file at New World Research, Ft. Walton Beach.

1985b **Draft report: Vertebrate faunal remains at 8Wl36, Horseshoe Bayou.** On file at New World Research.

Fuller, Richard S.

1985 The Bear Point phase of the Pensacola variant: the Protohistoric period in southwest Alabama. **The Florida Anthropologist** 38:150-155.

Fuller, R. S. and N. R. Stowe

1982 A proposed typology for late shell tempered ceramics in the Mobile Bay/Mobile Tensaw Delta region. In **Archaeology in Southwest Alabama: A collection of papers.** Edited by C. Curren. Alabama Tombigbee Regional Commission, Camden Alabama.

Kessler, Melvin

1982 **Chronological syllabus of the Armament Division, Part Two, the war years: 1942-1945.** Office of history, Armament Division, Eglin AFB.

Knight, Vernon J. Jr.

1984 Late Prehistoric adaptation in the Mobile Bay region. In **Perspectives on Gulf Coast prehistory,** edited by Dave D. Davis. University Presses of Florida, Gainesville.

Larson, Lewis

1980 Aboriginal subsistence technology on the southeastern Coastal Plain during the Late Prehistoric period. **Ripley P. Bullen Monographs in Anthropology and History,** 2. University Presses of Florida, Gainesville. Florida State Museum.

Lazarus, William C.
1965 Alligator Lake, a ceramic horizon site on the Northwest Florida coast. **The Florida Anthropologist** 23(2):83-124.

1971 The Fort Walton culture west of the Apalachicola River. **Southeastern Archaeological Conference Newsletter** 10(2):40-48.

Massoni, Julie
1988 **Camp Pinchot.** Office of History, Armament Division, Eglin AFB.

Mikell, Gregory A.
1987 Cultural resources survey of a portion of Hurlburt Field, Okaloosa County, Florida. **New World Research Report of Investigations** 162.

1990a **The Fort Walton Mississippian culture variant on the Northwest Florida Gulf Coast.** Paper presented at the Southeastern Archaeological Conference, Mobile.

1990b The Sheephead Bayou Site (8By150): a single component Fort Walton hamlet site in northwest Florida. **The Florida Anthropologist** 43(3):198-208.

Mikell, Greg, L. Janice Campbell and Prentice Thomas
1989 Archaeological site recording and testing at Tyndall Air Force Base, Florida. **New World Research, Report of Investigations,** 183.

Milanich, Jerald T. and Charles H. Fairbanks
1980 **Florida Archaeology.** Academic Press, New York.

Percy, George W.
1971 **Preliminary report to the Division of Recreation and Parks, Department of Natural Resources, State of Florida, on archaeological work in the Torreya State Park during the year of 1971 by the Department of Anthropology at Florida State University.** Manuscript on file, Florida Department of Natural Resources.

Percy, George W. and David S. Brose
1974 **Weeden Island ecology, subsistence, and village life in Northwest Florida.** Paper presented at the 39th Annual Meeting of the Society for American Archaeology, Washington, D.C.

Stowe, Noel R.
1985 The Pensacola variant and the Bottle Creek phase. **The Florida Anthropologist** 38:144-149.

Tesar, Louis
1980a Cultural resource assessment request proposed road construction, Route B and Route D, Eglin Air Force Base. **Okaloosa County Survey Number 508,** letter on file, Florida Division of Archives, History and Records Management.

Tesar, Louis (continued)
1980b The Leon County Bicentennial survey report: an archaeological survey of selected portions of Leon County, Florida. Performed for the Florida Bicentennial Commission, City of Tallahassee, and National Park Service by the Bureau of Historic Sites and Properties, Division of Archives, History and Records Management, Florida Department of State. **Miscellaneous Project Report Series** 49.

Thomas, Prentice M., Jr. and L. Janice Campbell
1985 **The Deptford to Santa Rosa/Swift Creek transition in the Florida panhandle.** Paper presented at the Southeastern Archaeological Conference, Pensacola.

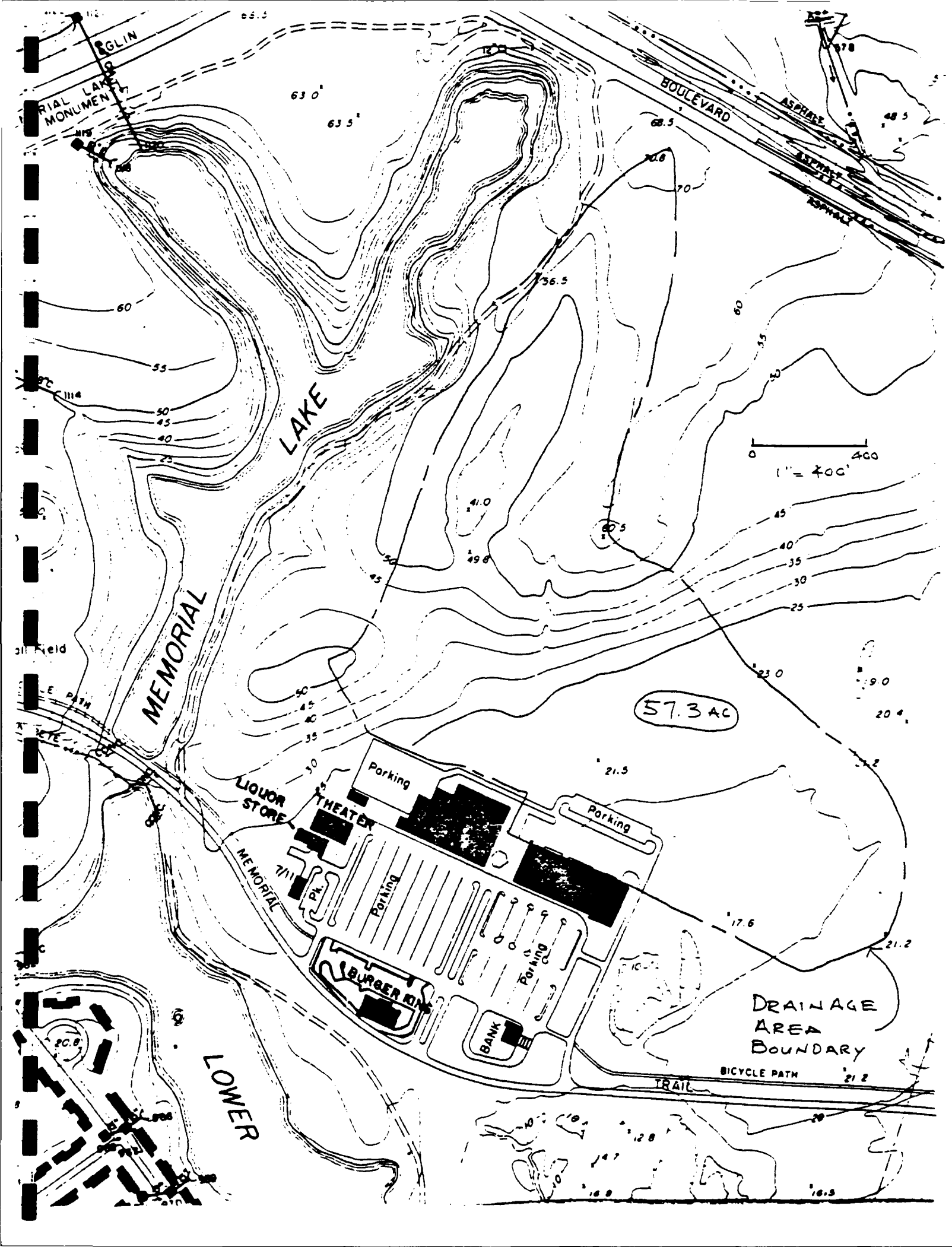
1990a Eglin Air Force Base, Historic Preservation Plan, Technical Synthesis. New **World Research, Inc. Report of Investigations No. 192**

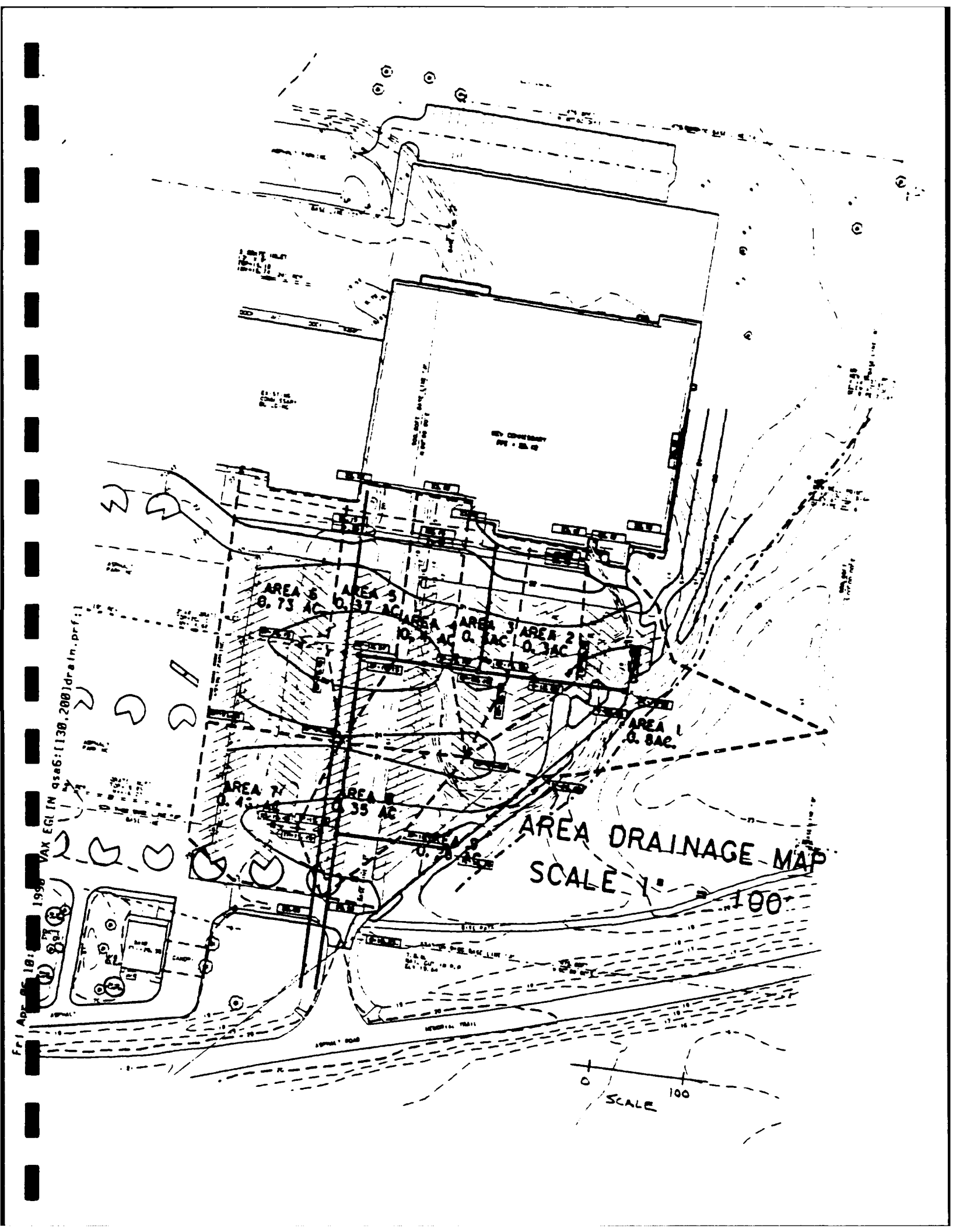
1990b **The Santa Rosa/Swift Creek culture on the Northwest Florida Gulf Coast: The Horseshoe Bayou** phase. Paper presented at the Southeastern Archaeological Conference, Mobile.

Willey, Gordon R.
1949 Archeology of the Florida Gulf Coast. **Smithsonian Miscellaneous Collections**

APPENDIX XI

Storm Drain Calculations
Carter & Burgess, Inc.


BOULEVARD
ASPHALT
ASPHALT
ASPHALT
LAKE
MEMORIAL
MEMORIAL
LOWER
0
400
1" = 400'
57.3 AC
Parking
Parking
Parking
Parking
Parking
LIQUOR STORE
THEATER
7/11
Ph.
BURGER KING
BANK
DRAINAGE AREA BOUNDARY
BICYCLE PATH
TRAIL


AREA 6
0.73 AC
AREA 5
0.37 AC
AREA 4
0.3 AC
AREA 3
0.1 AC
AREA 2
0.3 AC
AREA 1
0.8 AC
AREA 7
0.4 AC
AREA 8
0.35 AC
AREA DRAINAGE MAP
SCALE 1" = 100'
0
100
SCALE
Fri Apr 26 10:
1990
VAX EGLIN qsa6:[130,200]drain.prf;1

JOB: EG, N FEB

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS
1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2973 FORT WORTH, TX 76113
FORT WORTH · HOUSTON · DALLAS

EXHIBIT
SHEET 1 OF 2
DATE 04-26-90
BY BEW

NORTH EAST DUAL POND DESIGN STORM RUNOFF VOLUME

DESIGN STORM: 10-YR 24HR EVENT
DEPTH = 9.2 IN = P

TOTAL AREA DRAINING TO PONDS = 57.3 AC
TOTAL COMMISSARY FACILITY AREA = 4.0 AC
POND AREAS (ASSUMED): 2 AC OFFSITE
2 AC CF (IMPERVIOUS)

OFFSITE AREA POND
PERVIOUS AREAS CN = 36; $S = \frac{1000}{CN} - 10 = 17.78$

RUNOFF = $Q = \frac{[P - 0.2(S)]^2}{[P + 0.8(S)]} = \frac{[9.2 - 0.2(17.78)]^2}{[9.2 + 0.8(17.78)]} = \frac{31.85}{23.42}$

Q = 1.36 IN

PERVIOUS AREA: 57.3 − 4 AC (CF) − 4 AC (PONDS)
= 49.3 AC

PERVIOUS AREA RUNOFF VOLUME
49.3 AC (1.36 IN) 1/12 = 5.6 AC-FT

POND AREA RUNOFF VOLUME = 2 AC (9.2 IN) 1/2
= 1.5 AC FT

TOTAL VOLUME FOR OFFSITE AREA POND
= 5.6 AC-FT + 1.5 AC FT = 7.1 AC-FT

COMMISSARY AREA POND

IMPERVIOUS AREA CN = 98; $S = \frac{1000}{98} - 10 = 0.204$

RUNOFF = $Q = \frac{[P - 0.05(S)]^2}{[P + 0.95(S)]} = \frac{[9.2 - 0.05(0.204)]^2}{[9.2 + 0.95(0.204)]}$

$= \frac{84.45}{9.39} = 8.99$ IN

JOB: _____

EGLIN AFB

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS

1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2971 FORT WORTH, TX 76111
FORT WORTH · HOUSTON · DALLAS

EXHIBIT _____
SHEET 2 OF 2
DATE 12-06-95
BY EEW

IMPERVIOUS AREA RUNOFF VOLUME =
< AC (8.99 IN) 1/12
= 3.0 AC FT

POND AREA RUNOFF VOLUME
= 2.0 AC (9.2 IN) 1/12
= 1.5 AC

TOTAL VOLUME FOR COMMISSARY FACILITY (NORTH) POND VOLUME
3.0 + 1.5 = 4.5 AC

SUMMARY

OFFSITE AREA POND VOL: 7.1 AC-FT

COMMISSARY AREA (NORTH) POND VOL: 4.5 A-F

JOB

EAGLE AFE

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS
1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2973 FORT WORTH, TX 76113
FORT WORTH · HOUSTON · DALLAS

EXHIBIT
SHEET 1 OF 1
DATE 04-07-90
BY BEW

SOUTH POND STORM VOLUME

VOLUME REQD = 1" RUNOFF

DRAINAGE AREAS CONTRIBUTING.

AREA #	SIZE (AC)
1	
2	0.8
3	0.3
4	0.3
5	0.4
6	0.4
7	0.7
8	0.5
9	0.4
10	0.3
11	1.2
12	0.7
13	0.7
EXISTCE	0.5
NEWCE	1.5
	1.8
TOTAL	10.5 AC

ASSUMED POND SIZE 1 AC

TOTAL AREA = 10.5 AC + 1 AC = 11.5 AC

RUNOFF VOLUME = 11.5 AC (1 IN) 1 FT/12 IN

= 0.95 AC FT

SAY 1.0 AC-FT

JOB: EGLIN AFB

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS
1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2973 FORT WORTH, TX 76113
FORT WORTH · HOUSTON · DALLAS

EXHIBIT
SHEET OF
DATE 04-08-90
BY EEW

SOUTH POND OUTFALL SIZE

MAXIMUM HEAD 5.2 - 14.7 = 0.5 FT
(OUTLET ELEV)

$Q = C L H^{3/2}$

$C = 3.0$

$H = 0.5$

Q = LINE A + LINE B FLOWS = 31 + 39
= 70 CFS

$$L = \frac{Q}{CH^{3/2}} = \frac{70}{3(0.5)^{3/2}} = 66 \text{ FT OR } 17 \text{ FT SQUARE}$$

CHECK ORIFICE FLOW

$$Q = 0.6 A \sqrt{2gh} = 0.6(17)(17)\sqrt{2(32.2)(0.5)}$$

$= 984$ CFS > 72 CFS $\Rightarrow$ OK

JOB: EGLIN AFB

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS
1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2973 FORT WORTH, TX 76113
FORT WORTH · HOUSTON · DALLAS

EXHIBIT
SHEET 1 OF 1
DATE 04-05-90
BY EEW

INLET #	AREA #	AREA (AC)	C	I (IN/HR)	F (IN/HR)	Q (CFS)
1	1	0.8	0.95	7.4	0	5.6
2	2	0.3	0.95	7.4	0	2.1
3	3	0.3	0.95	7.4	0	2.1
4	4	0.4	0.95	7.4	0	2.8
5	5	0.4	0.95	7.4	0	2.8
6	6	0.7	0.95	7.4	0	4.9
7	7	0.5	0.95	7.4	0	3.5
8	8	0.4	0.95	7.4	0	2.8
9	9	0.3	0.95	7.4	0	2.1

$Q = C(I-F)A$

$T_c = 10$ MIN.

$I = 7.4$ IN/HR

INLET CAPACITY @ 0.5' HEAD : OPENING : 2'-1¼" × 1'-11"

$L = 2(2.104 + 1.958) = 8.125$ FT

$Q = 3LH^{3/2} = 3(8.125)(0.5)^{3/2} = 8.62$ CFS

EFFECTIVE FLOW = ½(8.6) = 4.3 CFS

MANHOLE OR INLET DESIGN POINT FROM	TO	DISTANCE BETWEEN POINTS (FEET)	DRAINAGE AREA INCREMENTAL AREA NO	INCREMENTAL AREA (ACRE)	TOTAL AREA (ACRE)	RUNOFF COEFF. C	INCREMENTAL CA	TOTAL CA	TIME OF CONCENTRATION INLET TIME (MIN)	FLOW TIME IN SEWER (MIN)	TOTAL TIME (MIN)	DESIGN FREQUENCY (YR)	INTENSITY (IN/HR)	PEAK FLOW IN PIPE (CFS)	PIPE SIZE (IN)	HYDRAULIC GRADIENT FRICTION SLOPE Sf (FT/FT)	ELEVATIONS UP-STREAM (FT MSL)	DOWN-STREAM (FT MSL)	V1 FLOW IN (FPS)	V2 FLOW OUT (FPS)	HEAD LOSS AT CHANGE IN SECTION V2**2 2g (FT)	V1**2 2g (FT)	Kj (CONST)	KjV1**2 2g (FT)	HEAD LOSS Hj (FT)	ELEV. OF H.G. GRADE (FT)	ELEV OF INVERT AT DESIGN POINT PIPE IN (FT MSL)	PIPE OUT (FT MSL)
																	LINE 'A'											
1	2	97.00	1	0.80	0.80	0.95	0.76	0.76	10.0	------	10.0	10	7.5	5.7	18	0.0029	19.26	18.98	------	3.2	0.16	------	0.00	------	------	19.26	15.36	15.07
2	3	80.00	2	0.30	1.10	0.95	0.29	1.05	10.0	0.5	10.5	10	7.5	7.8	18	0.0056	18.98	18.84	3.2	4.4	0.31	0.16	0.00	------	FULL	18.98	15.67	15.49
3	4	59.00	3, NEW CF	2.10	3.20	0.95	1.99	3.04	10.5	0.2	10.7	10	7.5	22.8	33	0.0019	18.84	18.53	4.4	3.8	0.23	0.31	0.00	------	FULL	18.84	14.24	14.06
4	5	72.00	4	0.40	3.60	0.95	0.38	3.42	10.7	0.3	11.0	10	7.5	25.7	33	0.0024	18.53	18.35	3.8	4.3	0.29	0.23	0.00	------	FULL	18.53	14.06	13.85
5	6	192.00	5	0.40	4.00	0.95	0.38	3.80	11.0	0.3	11.3	10	7.5	28.5	33	0.0029	18.29	17.74	4.3	4.8	0.36	0.29	1.00	0.29	0.07	18.36	13.85	13.27
6	7	179.00	9,8	0.80	4.80	0.95	0.57	4.37	11.3	0.7	11.9	10	7.5	32.8	33	0.0038	17.62	16.93	4.8	5.5	0.47	0.36	1.00	0.36	0.12	17.74	13.27	12.73
7	8	165.00	---	0.00	4.80	0.00	0.00	4.37	11.9	0.5	12.5	10	7.0	30.8	33	0.0033	16.93	16.38	5.5	5.2	0.41	0.47	0.00	------	FULL	16.93	12.73	12.24
8	10	413.00	---	0.00	4.80	0.00	0.00	4.37	12.5	0.5	13.0	10	7.0	30.8	33	0.0033	16.38	15.00	5.2	5.2	0.41	0.41	1.00	0.41	FULL	16.38	12.24	11.00
																	LATERAL 'A-1'											
10	3	147.00	NEW CF	1.90	1.80	0.95	1.71	1.71	10.0	------	10.0	10	7.5	12.8	18	0.0149	20.83	18.84	0.0	7.3	0.82	------	0.00	------	------	20.83	15.23	15.49
																	LATERAL 'A-2'											
11	6	144.00	9	0.30	0.30	0.95	0.29	0.29	10.0	------	10.0	10	7.5	2.1	18	0.0004	17.80	17.74	0.9	1.2	0.02	------	0.00	------	------	17.80	13.29	13.27
																	LINE B'											
1	2	180.00	10	1.20	1.20	0.95	1.14	1.14	10.0	------	10.0	10	7.5	8.5	18	0.0066	20.89	19.70	0.0	4.8	0.36	------	1.00	------	------	20.89	17.22	5.87
2	3	110.00	11	0.70	1.90	0.95	0.66	1.81	10.0	0.6	10.6	10	7.5	13.5	24	0.0038	19.70	19.28	4.8	4.3	0.29	0.36	0.00	------	FULL	19.70	15.12	14.92
3	4	51.00	6	0.70	2.60	0.95	0.66	2.47	10.6	0.4	11.1	10	7.5	18.5	33	0.0012	19.28	19.22	4.3	3.1	0.15	0.29	0.00	------	FULL	19.28	14.13	13.83
4	5	192.00	EXIST CF	1.50	4.10	0.95	1.43	3.90	11.1	0.3	11.3	10	7.5	29.2	33	0.0031	18.99	18.41	3.1	4.9	0.38	0.15	1.00	0.15	0.22	19.22	13.89	13.36
5	6	174.00	12,13,7	1.70	5.80	0.95	1.62	5.51	11.3	0.7	12.0	10	7.5	41.3	33	0.0061	18.03	16.97	4.9	7.0	0.75	0.38	1.00	0.38	0.38	18.41	13.36	12.87
6	7	185.00	---	0.00	5.80	0.00	0.00	5.51	12.0	0.4	12.4	10	7.0	38.8	33	0.0053	17.07	16.19	7.0	6.5	0.65	0.75	1.00	0.75	FULL	16.97	12.87	12.41
7	8	214.00	---	0.00	5.80	0.00	0.00	5.51	12.4	0.4	12.8	10	7.0	38.8	36	0.0033	16.38	15.87	6.5	5.5	0.48	0.65	1.00	0.65	FULL	16.19	12.18	11.56
8	9	139.00	---	0.00	5.80	0.00	0.00	5.51	12.8	0.7	13.5	10	7.0	38.8	36	0.0033	15.67	15.00	5.5	5.5	0.48	0.48	1.00	0.48	FULL	15.87	11.56	11.00
																	LATERAL 'B-1'											
12	4	208.00	EXIST CF	1.50	1.50	0.95	1.43	1.43	10.0	------	10.0	10	7.5	10.7	18	0.0104	21.37	19.22	0.0	8.0	0.57	------	0.00	------	------	21.37	15.36	14.92
																	LATERAL 'B-2'											
13	14	115.00	12	0.70	0.70	0.95	0.66	0.66	10.0	------	10.0	10	7.5	5.0	15	0.0060	20.42	19.74	0.0	4.1	0.26	------	0.00	------	------	20.42	18.24	15.88
14	15	176.00	13	0.50	1.20	0.95	0.48	1.14	10.0	0.5	10.5	10	7.5	8.5	18	0.0066	19.74	18.57	4.1	4.8	0.36	0.26	0.00	------	FULL	19.74	15.83	14.23
15	5	57.00	7	0.50	1.70	0.95	0.48	1.62	10.5	0.8	11.1	10	7.5	12.1	24	0.0029	18.57	18.41	4.8	3.9	0.23	0.36	0.00	------	FULL	18.57	13.73	13.36

04-06-'10

JOB: EGLIN AFB

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS
1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2973 FORT WORTH, TX 76113
FORT WORTH · HOUSTON · DALLAS

EXHIBIT
SHEET 1 OF 2
DATE 04-10-90
BY EEW

POND VOLUME CALCULATIONS (STORAGE)

SOUTH POND

ELEV	SURFACE AREA (SF)	AREA (AC)	AVG AREA	VOLUME (AC-FT)
14	66845	1.53		
			1.60	1.60
15	72895	1.67		
			1.75	1.75
16	79717	1.83		

FOR SOUTH LAKE: TOP OF PERMANENT POOL = 14.0 FT

TOP OF DRAWDOWN POOL = 14.7 FT

STORAGE BETWEEN 14.0' & 14.7 FT
= 0.7 (1.60) = 1.12 AC FT

VOLUME REQ'D FOR 1" RUNOFF
= 1.0 AC-FT ⇒ OK

JOB: EGLIN AFB

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS
1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2973 FORT WORTH, TX 76113
FORT WORTH · HOUSTON · DALLAS

EXHIBIT
SHEET 2 OF 2
DATE 04-10-90
BY BEW

NORTH (DRY) POND STORAGE VOLUME

ELEV	SURF AREA (SF)	AREA (AC)	AVG AREA	VOL (AC-FT)
17.5	124,630	2.86		
			2.93	1.47
18.0	130,343	2.99		
			3.08	3.08
19.0	137,960	3.17		
			3.25	3.25
20.0	145,296	3.33		

FOR NORTH POND POND BOTTOM = 17.5'
TOP OF STORAGE FILL = 20.0'

TOTAL STORAGE = 1.47 + 3.08 + 3.25
= 7.8 AC-FT
STORAGE REQD = 7.1 AC-FT

NORTH (WET) POND STORAGE VOLUME

14	63250 SF	1.45		
			1.72	
18	86796 SF	1.99		

TOP OF PERMANENT POOL = 14.7
TOP OF DRAWDOWN POOL = 18.0

STORAGE : 3.3 FT (1.72 AC-FT) = 5.7 AC-FT

STORAGE REQD 4.5 AC-FT

JOB: EGLIN AFB

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS
1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2973 FORT WORTH, TX 76113
FORT WORTH · HOUSTON · DALLAS

EXHIBIT
SHEET 1 OF
DATE 04-09-00
BY SEW

COST ESTIMATE QUANTITIES - STORM DRAINAGE
(SOUTH OF NEW COMMISSARY FACILITY)

ITEM	QUANTITY
18" RCP	592 LF
33" RCP	1,612 LF
36" RCP	416 LF
INLETS	9 EA
MANHOLES	8 EA
END OUTLET	1 EA
EXCAVATION	43,300 CY (ANCE)
EMBANKMENT	860 CY (BEEM)
HEADWALLS	2 EA

JOB _____

EGLIN AFB

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS
1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2973 FORT WORTH, TX 76113
FORT WORTH · HOUSTON · DALLAS

EXHIBIT _____
SHEET 1 OF 2
DATE 04-10-90
BY DEW

POND EXCAVATION VOLUMES

SOUTH POND

ELEV	SURFACE AREA (SF)	AVG AREA (SF)	VOLUME (CY)
11	31,786		
		34,107	1263
12	36428		
		42220	1564
13	48011		
		57428	2127
14	66845		
		69,870	2588
15	72,895		
		76306	2826
16	79717		
		65,657	2432
17	51597		
		34,611	1282
18	17624		

14,030 CY TOTAL

FOR 1FT DEPTH, THIS IS ALSO VOLUME IN CF

SAY 14,100 CY

JOB: EGLIN AFB

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS
1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2973 FORT WORTH, TX 76113
FORT WORTH · HOUSTON · DALLAS

EXHIBIT
SHEET 2 OF 2
DATE 04-10-90
BY BEW

NORTH DRY POND

ELEV	SURFACE AREA (SF)	AVG AREA (SF)	VOLUME (CF)	VOLUME (cy)
17.5	124,630			
		127487	63744	2,361
19.0	130343			
		134152	134152	4969
19	137960			
		141629	141629	5246
20	145298			

TOTAL 12576 cy

SAY 12,600 cy

NORTH WET POND

11	34900			
		49075	147225	
14	63250			5453
		75023	300092	11,114
18	86796			

TOTAL 16,567 cy

SAY 16,600 cy

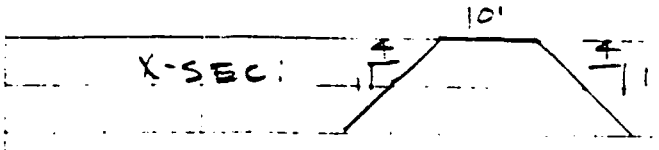
TOTAL EXCAVATION VOLUME = 14,100 + 12600 + 16600
= 43,300 cy

JOB: Eg--- AFB

CARTER & BURGESS, INC.
ENGINEERS · PLANNERS · SURVEYORS
1100 MACON STREET FORT WORTH, TEXAS 76102 (817) 335-2611
MAILING ADDRESS P.O. BOX 2973 FORT WORTH, TX 76113
FORT WORTH · HOUSTON · DALLAS

EXHIBIT
SHEET 1 OF
DATE 06-10-90
BY BEW

BERM EMBANKMENT VOLUME

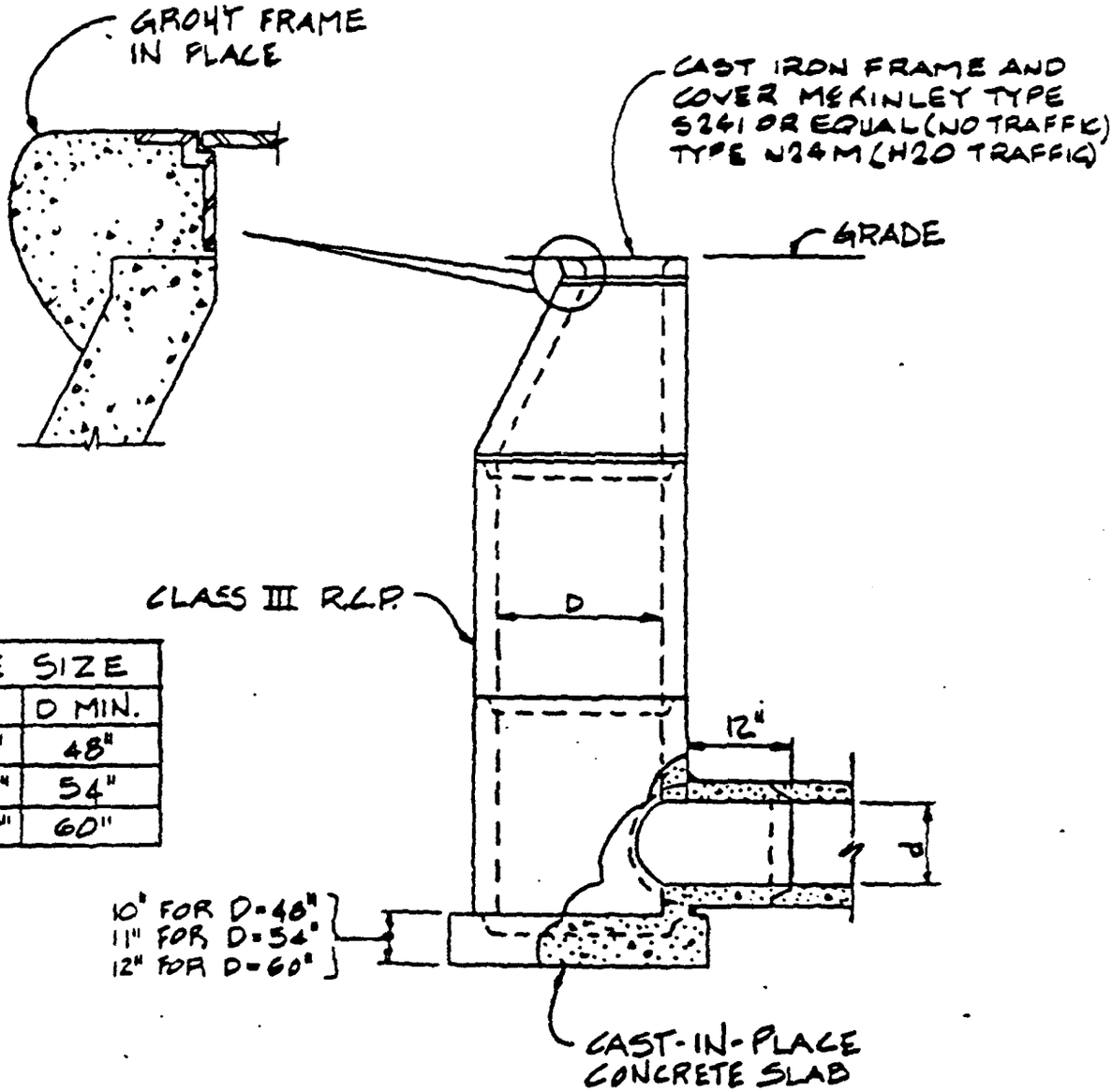


X-SEC: — 21 ELEV

AREA = 10(H) + 4H²

STA	DIST (FT)	HEIGHT (FT)	AREA (SF)	AVG (SF)	VOLUME (CF)	VOLUME (cy)
0+00		0	0			
	85			7	595	22
0+85		1	14			
	392			25	9800	363
4 77		2	36			
	200			36	7200	267
677		2	36			
	189			25	4725	175
866		1	14			
	130			7	910	34
996		0	0			

TOTAL 861 cy

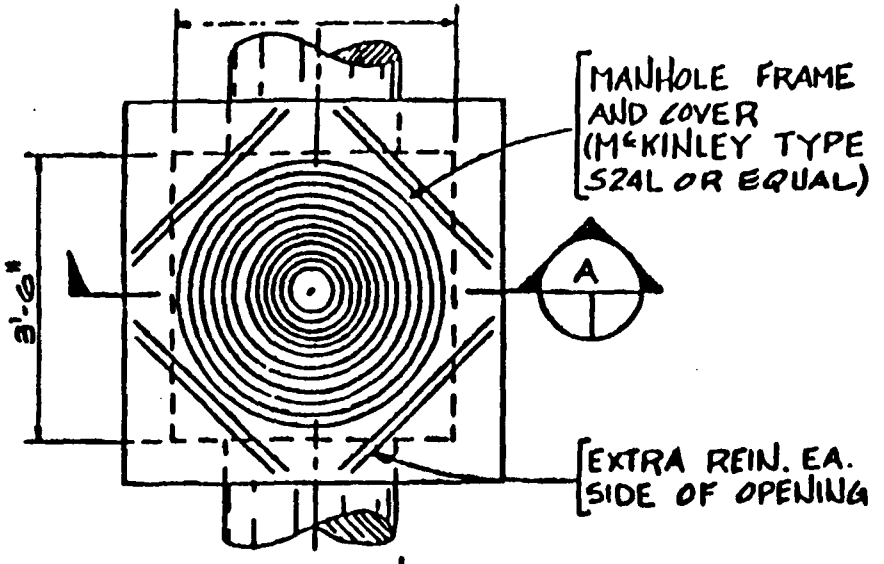


PIPE SIZE	
d	D MIN.
≤ 24"	48"
≤ 27"	54"
≤ 30"	60"

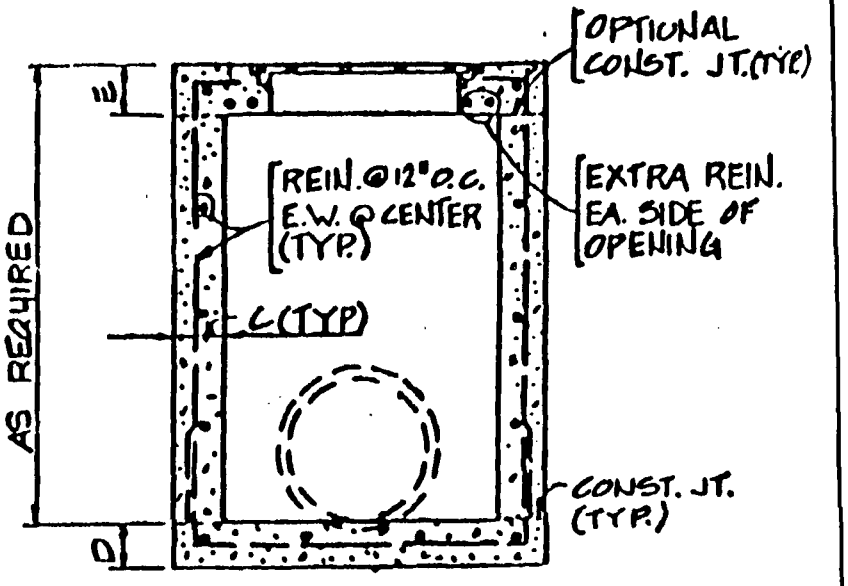
PRE-CAST MANHOLE

N.T.S.

A47



PLAN



SECTION A

DIMENSION SCHEDULE	
PIPE SIZE	A
≤ 36"	4'-0"
42"	4'-6"
48"	5'-0"
54"	5'-6"
60"	6'-0"
66"	7'-0"
72"	7'-6"
84"	8'-6"

DIMENSION SCHEDULE	C	D	E
NON-TRAFFIC AREA	6"	8"	8"
UP TO 9K WHEEL LOAD	6"	10"	10"
UP TO 25K WHEEL LOAD	8"	10"	12"

TABLE OF DIMENSIONS
TYPE 'A' AND 'B'

NO. OF PIPES	DIAM. OF PIPES	G	K	X	H	Y	W	BAR SIZE *
1	42"	~	12"	5'-3"	4'-6"	6'-0"	11'-0 1/2"	#4
2	"	2'-2"	"	0'-11"	"	"	16'-E 1/4"	"
3	"	"	"	16'-7"	"	"	22'-6 1/4"	"
4	"	"	"	22'-3"	"	"	28'-0 1/4"	"
1	48"	~	15"	5'-10"	5'-3"	7'-0"	2'-9 1/8"	#4
2	"	2'-5	"	12'-3"	"	"	9'-2 1/8"	"
3	"	"	"	18'-8"	"	"	25'-7 1/8"	"
4	"	"	"	25'-1"	"	"	32'-0 1/8"	"
1	54"	~	15"	6'-5"	5'-9"	8'-0"	14'-6"	#4
2	"	2'-0"	"	13'-9"	"	"	2'-0"	"
3	"	"	"	21'-1"	"	"	20'-2"	"
4	"	"	"	28'-5"	"	"	36'-6"	"
1	60"	~	5"	7'-0"	6'-3"	9'-0"	16'-2 7/8"	#4
2	"	3'-0"	"	15'-0"	"	"	24'-2 7/8"	"
3	"	"	"	23'-0"	"	"	32'-2 7/8"	"
4	"	"	"	31'-0"	"	"	40'-2 7/8"	"
1	66"	~	15"	7'-7"	6'-9"	10'-0"	[illegible]	#5
2	"	3'-1"	"	16'-2"	"	"	26'-6 3/4"	"
3	"	"	"	24'-9"	"	"	35'-1 3/4"	"
4	"	"	"	33'-4"	"	"	43'-8 3/4"	"
1	72"	~	15"	8'-2"	7'-3"	11'-0"	[illegible]	#5
2	"	3'-2"	"	17'-4"	"	"	25'-0 5/8	"
3	"	"	"	26'-6"	"	"	35'-5 5/8	"
4	"	"	"	35'-8"	"	"	[illegible]	"

CONCRETE HEADWALL

FOR CONCRETE PIPE - 90° - SINGLE AND MULTIPLE PIPES

* - REINFORCING BARS @ 12" O.C.E.W.

PLATE A-55

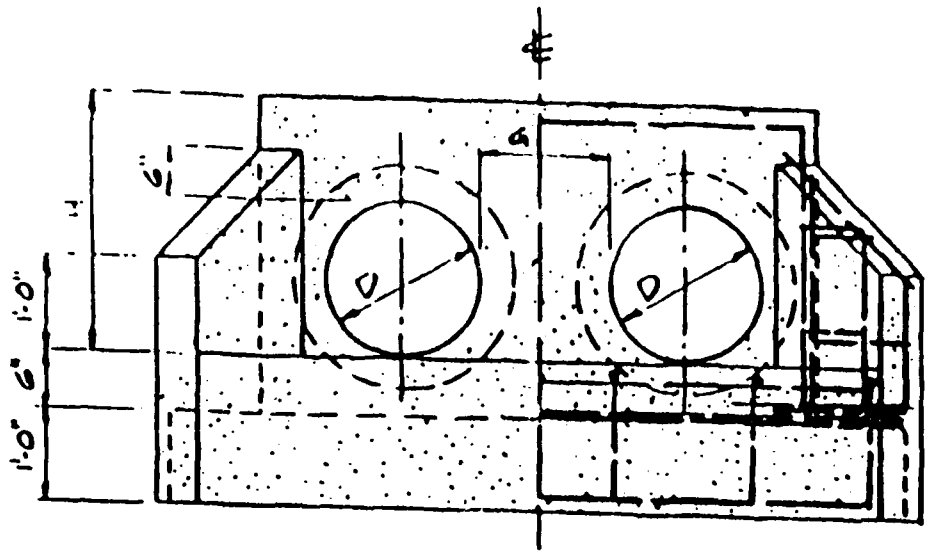
NO. OF PIPES	DIAM. OF PIPE	TABLE OF DIMENSIONS TYPE "A" AND "B"							
	D	G	K	X	H	Y	W	BAR SIZE *
1	12"	~	12"	2'-4"	2'-0"	1'-0"	2'-4"	#3
2	"	10"	"	4'-2"	"	"	4'-2"	"
3	"	"	"	6'-0"	"	"	6'-0"	"
4	"	"	"	7'-10"	"	"	7'-10"	"
1	15"	~	12"	2'-7½"	2'-3"	1'-6"	3'-2½"	#3
2	"	1'-0"	"	4'-10½"	"	"	5'-5½"	"
3	"	"	"	7'-1½"	"	"	7'-8½"	"
4	"	"	"	9'-4½"	"	"	9'-11½"	"
1	18"	~	12"	2'-11"	2'-6"	2'-0"	4'-0⅞"	#3
2	"	1'-2"	"	5'-7"	"	"	6'-8⅞"	"
3	"	"	"	8'-3"	"	"	9'-4⅞"	"
4	"	"	"	10'-11"	"	"	12'-0⅞"	"
1	24"	~	12"	3'-6"	3'-0"	3'-0"	5'-9¾"	#3
2	"	1'-5"	"	6'-11"	"	"	9'-2¾"	"
3	"	"	"	10'-4"	"	"	12'-7¾"	"
4	"	"	"	13'-9"	"	"	16'-0¾"	"
1	30"	~	12"	4'-1"	3'-6"	4'-0"	7'-6⅝"	#3
2	"	1'-8"	"	8'-3"	"	"	11'-8⅝"	"
3	"	"	"	12'-5"	"	"	15'-10⅝"	"
4	"	"	"	16'-7"	"	"	20'-0⅝"	"
1	36"	~	12"	4'-8"	4'-0"	5'-0"	9'-3½"	#4
2	"	1'-11"	"	9'-7"	"	"	14'-2½"	"
3	"	"	"	14'-6"	"	"	19'-1½"	"
4	"	"	"	19'-5"	"	"	24'-0½"	"

CONCRETE HEADWALL

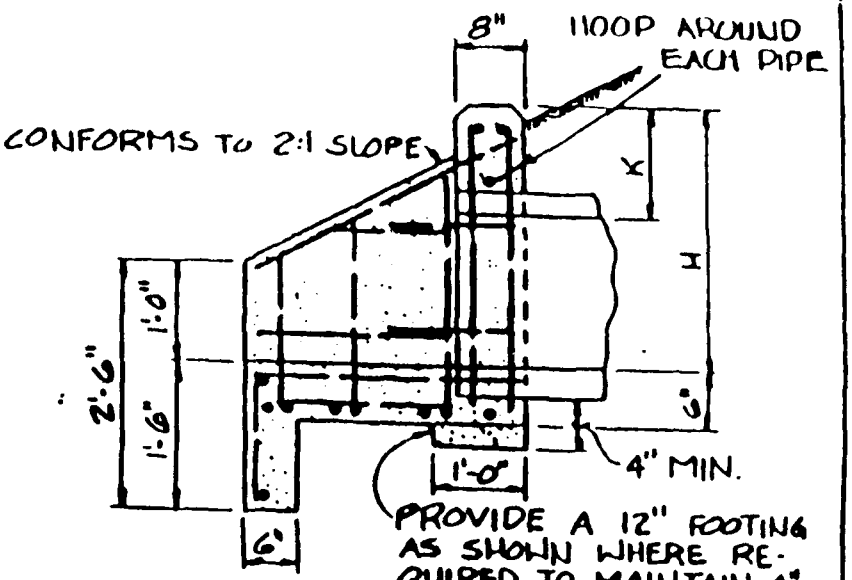
FOR CONCRETE PIPE - 90° - SINGLE AND MULTIPLE PIPES

* - REINFORCING BARS @ 12" C.C. E.W.

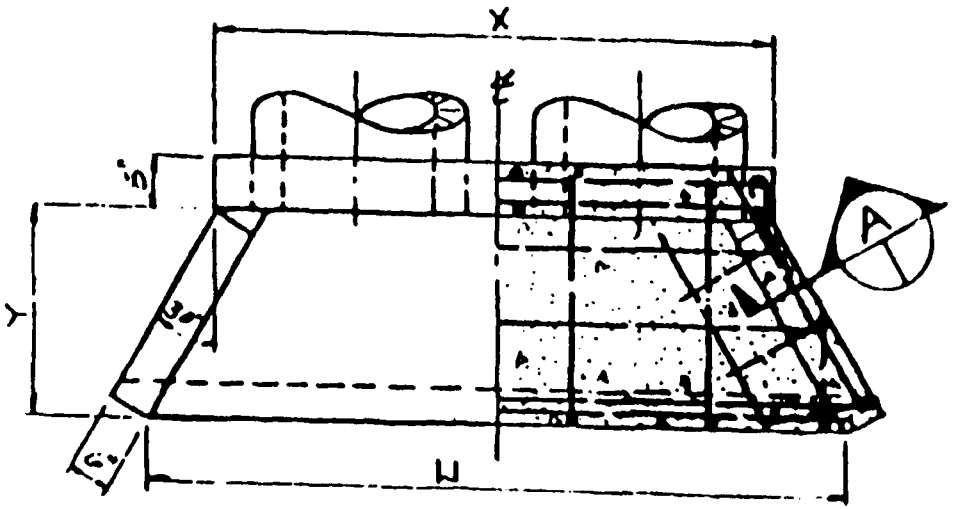
A-54



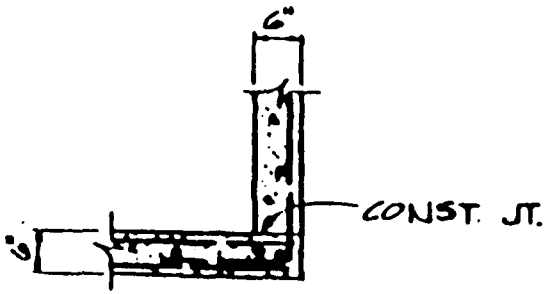
ELEVATION



TYPICAL WING ELEVATION



PLAN



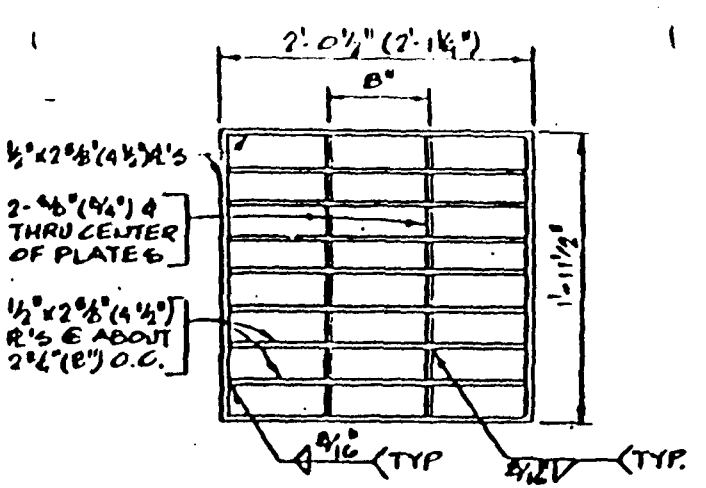
SECTION A

CONCRETE HEADWALL FOR CONCRETE PIPE

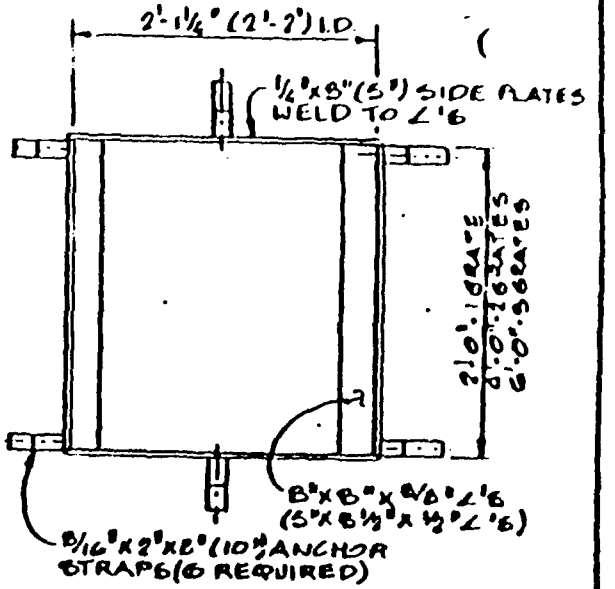
MULTIPLE PIPES - 90°

N.T.S.

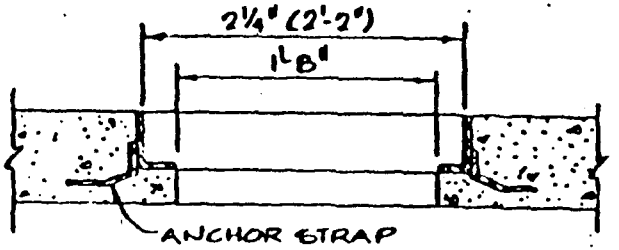
PLATE A-53



GRATE PLAN



FRAME PLAN



SECTION THRU INSTALLED FRAME

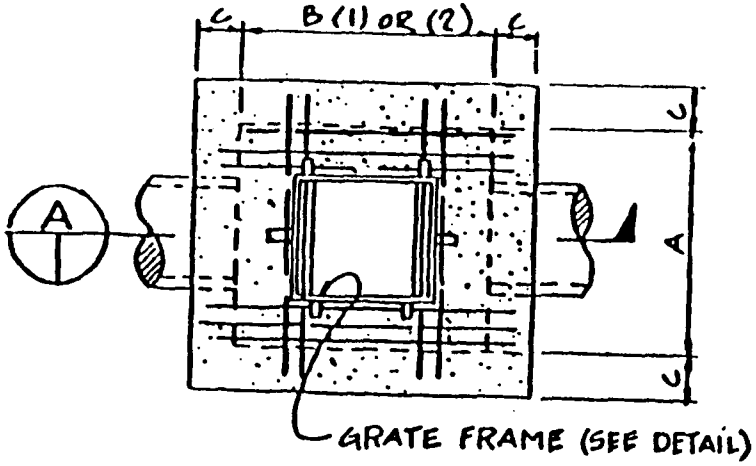
NOTES TO DESIGNER:

1. ALL DIMENSIONS APPLY TO NON-TRAFFIC, 7K AND 25K LOADING EXCEPT AS NOTED BY PARENTHESES. ( )
2. DIMENSIONS IN PARENTHESES APPLY TO 25K LOADING ONLY.

SURFACE INLET GRATE AND FRAME

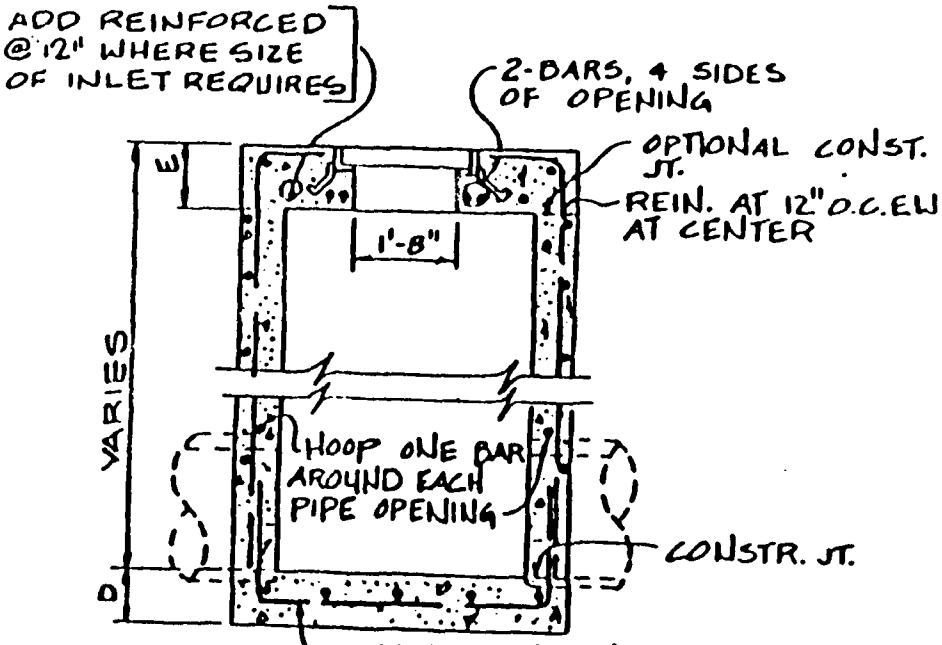
NTS

PLATE J-5.1



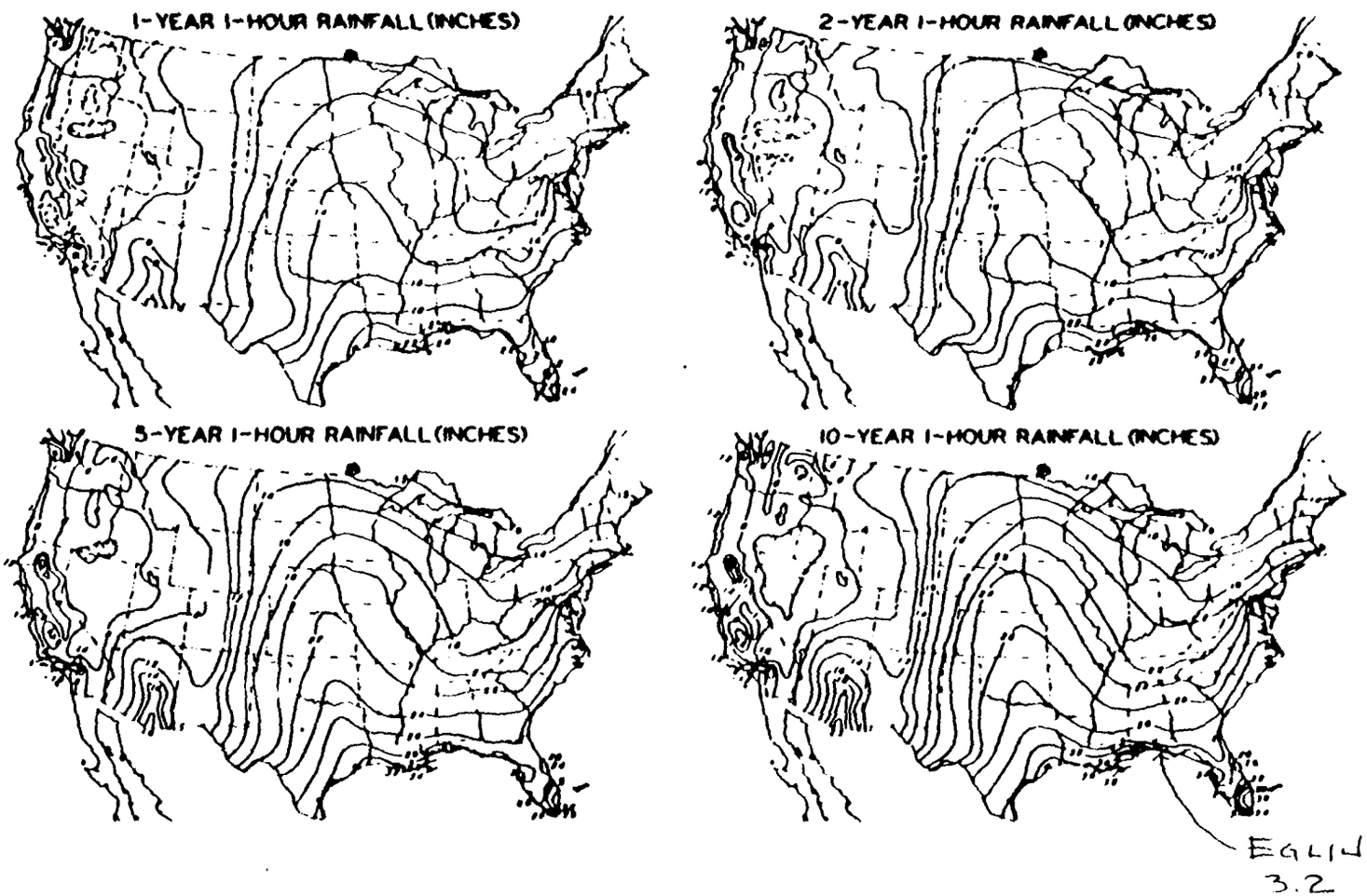
PLAN

DIMENSION SCHEDULE			
PIPE SIZE	A	NUMBER OF GRATES	B
36" OR LESS	4'-0"	1	4'-0"
42"	4'-6"		
48"	5'-0"	2	6'-0"
54"	5'-6"		
60"	6'-0"		
66"	7'-0"	3	8'-0"
72"	7'-6"		
84"	8'-6"		



SECTION A

DIMENSION SCHEDULE	C	D	E
NON TRAFFIC AREA	6"	8"	8"
UP TO 9K WHEEL LOAD	6"	10"	10"
UP TO 25K WHEEL LOAD	8"	10"	12"



EGLIN
3.2

NOTE: CHART REPRODUCED FROM U. S. WEATHER BUREAU TECHNICAL PAPER NO. 40, RAINFALL FREQUENCY ATLAS OF THE UNITED STATES, WASHINGTON, D. C., MAY 1961.

DESIGN STORM INDEX
ONE-HOUR RAINFALL INTENSITY-FREQUENCY DATA
FOR CONTINENTAL UNITED STATES EXCLUDING ALASKA

Figure 1

C.13

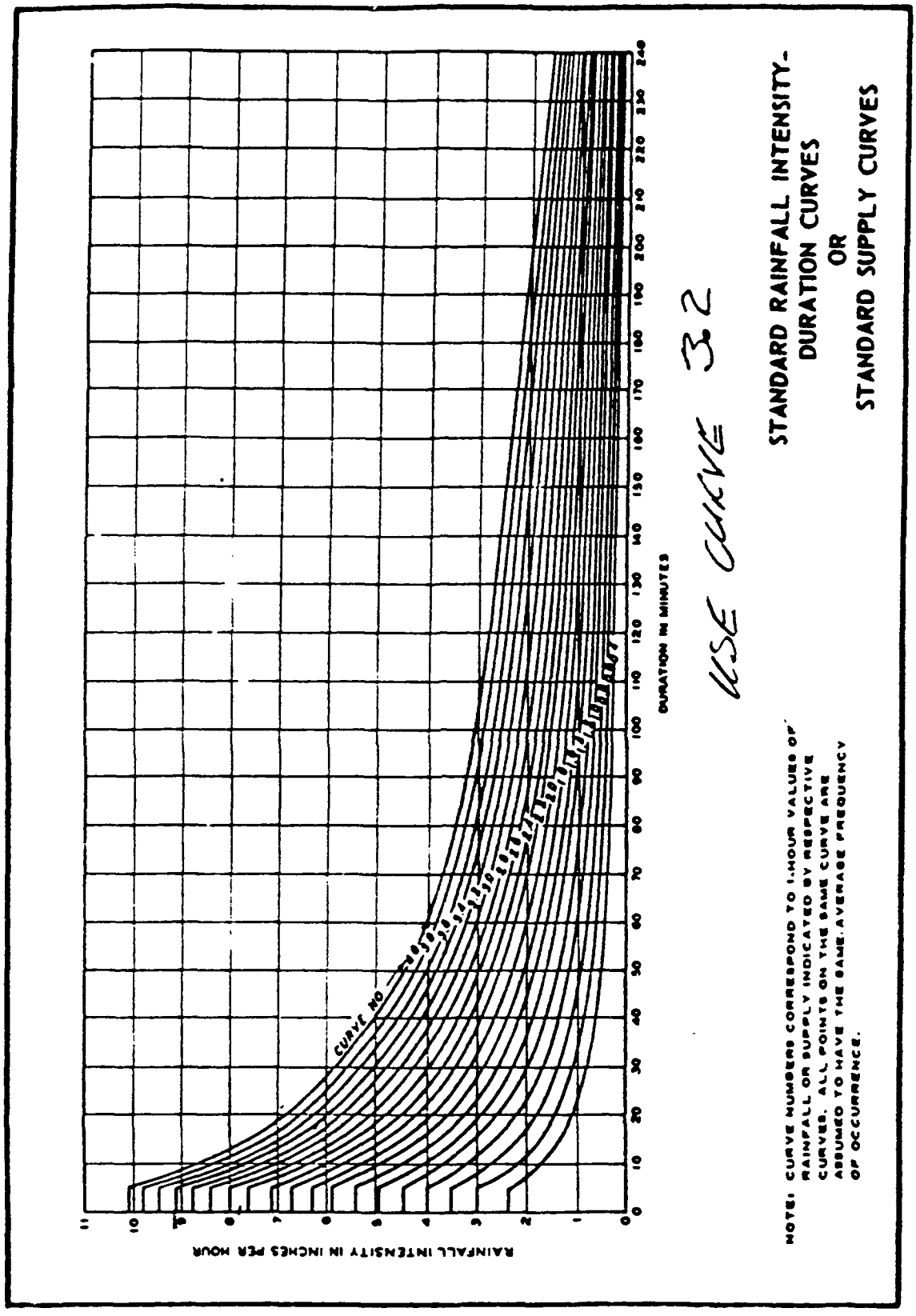

STANDARD RAINFALL INTENSITY-
DURATION CURVES
OR
STANDARD SUPPLY CURVES
USE CURVE 32
CURVE NO
DURATION IN MINUTES
RAINFALL INTENSITY IN INCHES PER HOUR
NOTE: CURVE NUMBERS CORRESPOND TO 1-HOUR VALUES OF RAINFALL OR SUPPLY INDICATED BY RESPECTIVE CURVES. ALL POINTS ON THE SAME CURVE ARE ASSUMED TO HAVE THE SAME AVERAGE FREQUENCY OF OCCURRENCE.

Figure 2

C14